PACE

Partnerships for Access to Community Electricity

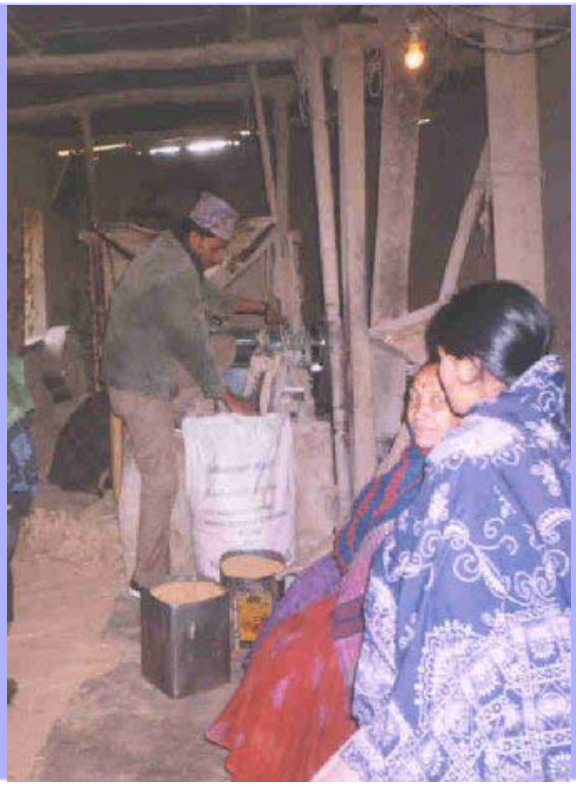
Policy Guidelines

Ethiopia

Nepal

Sri Lanka

Uganda



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Partnerships for Access to Community Electricity (PACE)

Policy Guidelines

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Foreword

The following PACE Guide has been brought together by energy and development expertise from Ethiopia, Nepal, Sri Lanka and the UK.

Contributions to the content of this publication have been made by Melessew Shanko and Hilawe Lakew (MGP, Ethiopia), Girish Kharel (SBB, Nepal), Lalith Gunaratne (LGA, Sri Lanka), Abdalla Kyezira (KCL, Uganda), Lillian Nsubuga, Hannah Isaac, Jeremy Doyle and Mike Bess (ESD, UK)

Review has been performed by other leading experts in the field of energy and development and their comments have been incorporated in order to produce this final document, which we hope you will find to be insightful and practical.

The guide was produced as part of a project funded by the UK Department for International Development (DFID) under the Engineering Knowledge and Research Programme (KaR). Note that the views represented in the report are not necessarily those of DFID.

This publication is also available online at http://pace.energyprojects.net. For more information, contact:

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Report Contents

Acronyms and Abbreviations

A	Ampere
ACAP	Annapuma Area Conservation Project
ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre, Nepal
AFDB	African Development Bank
BUDS-ERT	Business Development Support Unit of the ERT (Uganda)
CBO	Community Based Organisation
CEB	Ceylon Electricity Board
DfID	Department for International Development
ECS	Electricity Consumers Society, Sri Lanka
EELPA	Ethiopian Electric Light and Power Authority
EEPCO	Ethiopian Electric Power Corporation
EIA	Environmental Impact Assessment
EIB	European Investment Bank
ERA	Electricity Regulatory Authority (Uganda)
EREDPC	Ethiopian Rural Energy Development and Promotion Centre
ERT	Electricity for Rural Transformation
ESD	Energy Services Delivery
ESD Ltd	Energy for Sustainable Development Ltd, UK
GEF	Global Environment Facility
GoE	Government of Ethiopia
GNP	Gross National Product
GoU	Government of Uganda
GTZ	German Technical Co-operation
HDI	Human Development Index
ICT	Information and communications technologies
IPP	Independent Power Producer
ITDG	Intermediate Technology Development Group
JICA	Japanese International Cooperation Agency
kW/kWh	Kilowatt/kilowatt hour
MEMD	Ministry of Energy and Mineral Development, Uganda
MFI	MicroFinance Institutions
MoI	Ministry of Infrastructure, Ethiopia
MW/MWh	Megawatt/megawatt hour
MoRD	Ministry of Rural Development
NEA	Nepal Electricity Authority
NGO	Non-Government Organisation
NORAD	Norwegian Agency for Development Co-operation
PACE	Partnerships for Access to Community Electricity (this project)
PCE	Project Champion Entity
PSFU	Private Sector Foundation Uganda
PUCSL	Public Utilities Commission of Sri Lanka
PV	Photovoltaic
REA	Rural Energy Agency (Uganda)
REF	Rural Electrification Fund
REB	Rural Electrification Board

REDP	Renewable Energy Development Program (UNDP) Nepal
REES	Rural Electrification Executive Secretariat (Ethiopia)
RERED	Renewable Electrification for Rural Economic Development (Sri Lanka)
RESP	Rural Electrification Strategy and Plan (Uganda)
SCS	Self Contained (Electricity Distribution) System
SHS	Solar Home Systems
SIDA	Swedish International Development Agency
SWOT	Strengths Weaknesses, Opportunities and Threats
UEB	Uganda Electricity Board
UNBS	Uganda National Bureau of Standards
UNDP	United Nations Development Program
UPPPRE	The Uganda Photovoltaic Pilot Project for Rural Electrification

This Guide was produced as part of a project funded by the UK Department for International Development (DfID) under the Engineering Knowledge and Research Programme.

Part I: INTERNATIONAL GUIDELINES

By ESD Ltd

Contents: Part I International Guidelines

EXECUTIVE SUMMARY

This document is a summary of the experience gained during an 18 month applied research programme in Ethiopia, Nepal, Sri Lanka and Uganda. It is drawn from a diverse set of research activities.

The objective of the work was to determine how best to accelerate wider access and increase the livelihood impacts of electrification projects in developing countries. The theme of the project has been Public-Private Partnerships, reflecting the notion that both private and public entities have important and distinct roles to play in rural electrification.

The work done has been very wide ranging. It has involved studies of individual villages in each country that have gone through an electrification event in the last 10 years or so. Moving on from the experience at this micro or "grass roots" level, it has also engaged principal actors in national government and the private sector to determine needs and priorities. This has been done through national dialogue, South-South dialogue and inter-country exchanges.

By using a diverse set of countries with quite different experiences in rural electrification and development, the project has revealed some valuable country-specific issues, which are unique to that country. At the same time, some issues are clearly common or directly complementary to those in the other countries, such as the implications of electricity sector reform. There are therefore both country specific lessons and wider, trans-national lessons to be learned from the PACE project.

These different lessons are compiled in this set of guidance documentation, which comprise this international guide and four country guidelines. Each of the country guidelines is specifically focused on the needs and priorities of that country, drawing on local experience and including useful project case studies. They also take account of opportunities that may have arisen through an understanding of other country experiences in the PACE project.

The expected audience for this work is a number of stakeholder groups in the development sector, including but not limited to:

- Developing country policy makers
- Local investors in the developing country energy sector
- International investors in the developing country energy sector
- Multilateral and bilateral aid agencies
- Non-government organisations (NGOs)
- International consultants
- International developers of energy projects

SUMMARY OF PACE PROJECT

OVERVIEW

The PACE project began in July 2002 and ended in December 2003. The project was carried out by MGP in Ethiopia, SBB in Nepal, LGA in Sri Lanka and KCL in Uganda; and was managed by ESD Ltd of the UK. The objective of the project was to develop a deeper understanding about the role of public-private partnerships in delivering electricity to poor households and communities in rural areas.

This work focused exclusively on electricity, which is a subset of the wider energy sector. The electricity sector offers considerable opportunities in alleviating poverty and this project has focused on those opportunities. Electricity is also a potent symbol of development and attracts interest at all levels, from developing country communities through to national governments who design and implement strategies for development.

A number of relevant issues are of key significance in many developing countries and contributed to the approach of the work carried out during the course of this project:

- **Wide access and benefits to the poor** often occur through two broad components of electrification: a) local economic development; and b) improvements in health and education services. Achieving improvements in these "prime movers" in development is crucial.
- **The Public sector has responsibility for achieving development goals** at a national and local level. It is therefore in the interests of government to direct and support the participation of the private sector such that the widest possible benefits can accrue. Increasing decentralisation of power from national to local levels is an important driver here. Key to success of rural electrification is the political and administrative power of local authorities and their capacity to engage developers and investors. Increasingly Public Private Partnerships that develop are not made at a national level, but almost entirely develop at a local authority level.
- **Private sector participation in the electricity sector** in many developing countries is growing in part due to the reform of utilities. In parallel, the maturing of renewable energy technologies offers growing opportunities for non-grid electricity solutions for rural people

There are a large range of issues and involvement of different stakeholders in the successful development of rural projects. To illustrate this, Figure 1 shows the traditional process of project development and provides an indication of the involvement of different actors at different stages of that process. Figure 2 shows the further dimension of participation by the private sector under a number of possible contracting types[1].

Different country programmes will have differently designed requirements from the various stakeholders. However, it is important to highlight the need for the types of partnerships and communications that must happen during the course of a typical project. Also of note is that due to the relatively small scale and the physical location of rural projects, many of these relationships must happen at the local level.

The extent to which these partnerships are initiated depends on the existence (and performance) of appropriate policy and formal/informal networks. Market forces also play a role in initiating new partnerships, through the recognition of emerging business opportunities.

[1] A guide showing the types of Public Private Partnership arrangements commonly in use internationally is available from the project web site (http://pace.energyprojects.net)

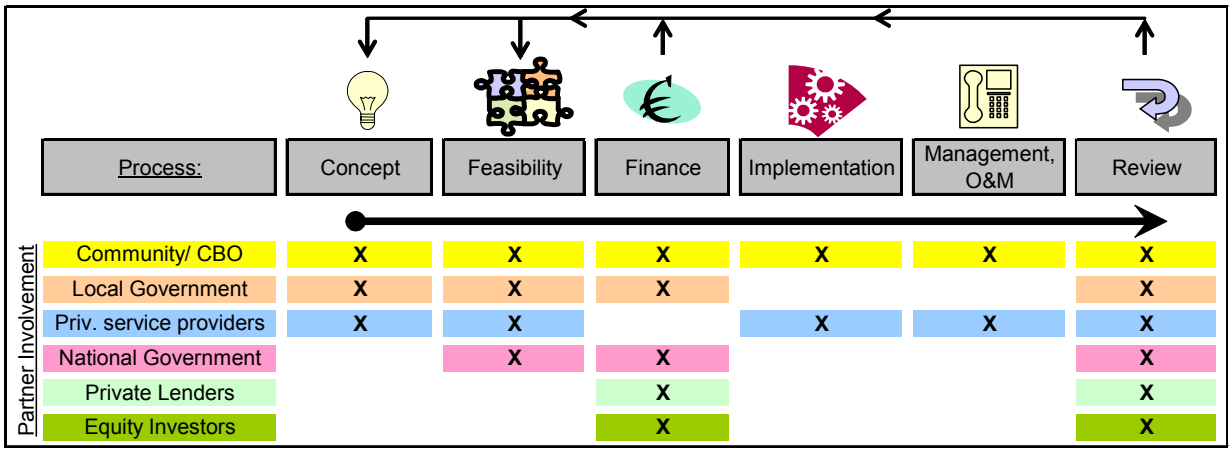

Figure 1: Partnerships in project implementation

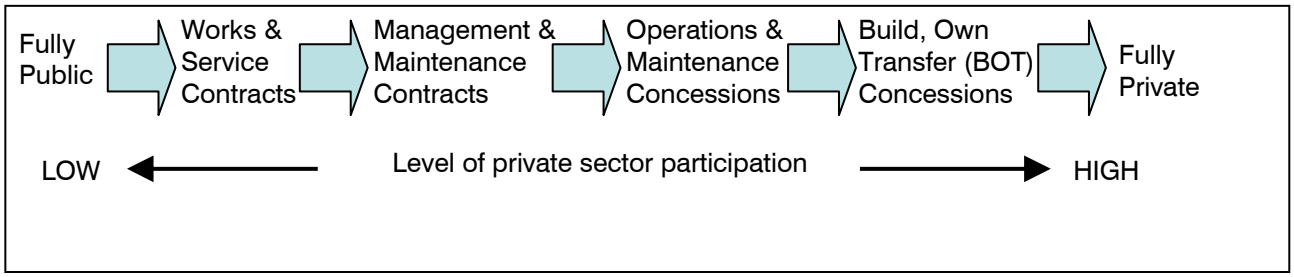

Figure 2: Level of public-private involvement in projects

It is the combination of these dynamics and their effect on successful implementation and sustainability of projects that were at the heart of research during the course of the PACE project.

ACTIVITIES

In brief, the project was carried out in two phases, the core components of which are indicated below:

1 **Country assessments, including desk reviews and livelihood analysis of case studies.**

- Desk review of country situations – see PACE website for the four country reports entitled: "Overview of the Electricity Sector in Relation to Public Private Partnerships"
- Select electricity projects to be assessed
- Develop methodologies and perform project assessments
- Analyse results for project assessments and prepare case study information (these case studies are annexed to the four Country Guidelines)

2 **Evaluation of partnership models and promoting the piloting of new projects**

- Support development of new project concepts
- South-South exchange visits and dialogue to review policies and measures
- Review and compilation of lessons learned, including these guidelines

OUTPUTS

The PACE project focused on the following components in order to generate useful research outputs:

- Explore the range of different issues that are associated with successfully achieving sustainable electricity projects in four very different countries.
- Work to understand the livelihood impacts of electricity
- Examine the potential to widen access for and increase benefits to the poorest in society through enabling support frameworks.

Again, it must be stressed that the interface between the various public and private entities was considered a core issue.

Although many of the benefits of the PACE project have been felt in the countries involved – Ethiopia, Nepal, Sri Lanka and Uganda – the purpose of the project has been to illustrate findings to a much wider audience.

To this effect a useful set of documentation is now available, which illustrates a wide range of country and project contexts. The way that the information from this project is presented is illustrated in Figure 3 below.

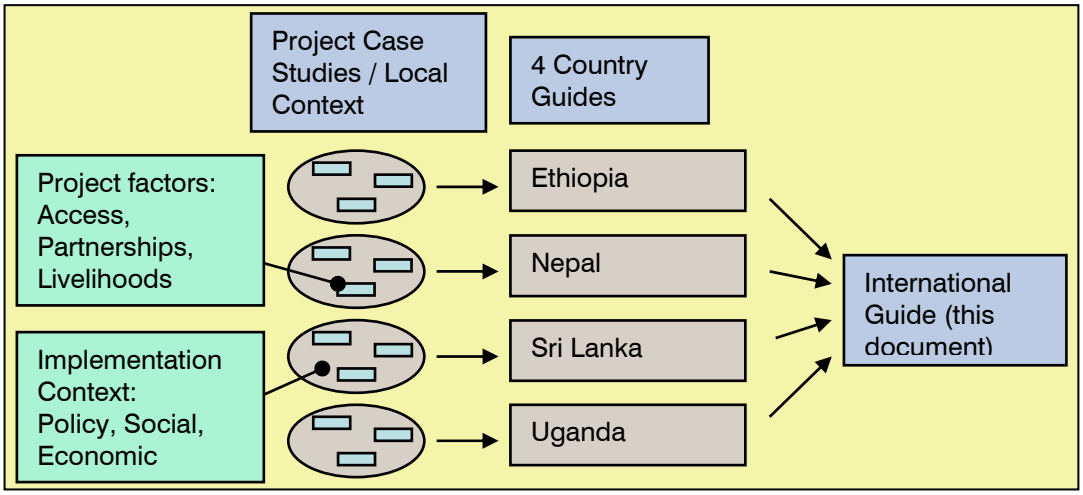

Figure 3: PACE Project Outputs

The information provided in this booklet is therefore based upon two key components of work:

- Case study livelihoods analysis based on interviews, questionnaires and focus groups conducted to real projects that have previously been implemented in each of the four countries. This provides concrete examples of what kinds of projects have been implemented to date in each country, how they were planned and what can be learned from them;
- Dialogue and engagement at all levels from local to national to determine the "Implementation Context" (Policy, Social, and Economic) for projects in each country. This process-based activity allowed a good understanding of the main issues facing expansion of rural electrification projects. In particular, the livelihoods dimensions were explored. This part of the process involved a number of South-South exchange and networking opportunities during the course of the project. A wide range of stakeholder views were determined on how to successfully realise sustainable energy projects and at the same time maximise livelihood benefits to the poorest in society.

More detail is provided on these two elements in the following sections.

CASE STUDY LIVELIHOODS ANALYSIS[2]

Information about successful project activities and the impact of projects on livelihoods was generated through literature review and through collection of primary research data from individual electrification case studies. A set of research tools was developed to meet the objectives of the project. The methodology included household and institutional questionnaires, focus group discussions and interviews.

The tools were designed to determine the true history of the project from concept to operation. In making the case study assessments, the relationships between the different actors were qualitatively assessed in order to understand why projects had succeeded or failed. Importantly, consumers of electricity (both household and institutional) were asked to provide feedback about how the arrival of electricity in the community had affected their lives.

This then made it possible to understand the sometimes complex and indirect impact of electricity on people's livelihoods. Figure 4 provides a list of the case studies that were completed including a broad assessment of livelihood impact and sustainability.

	Livelihood Impacts	**Sustainability**
ETHIOPIA		
Private Diesel Off-Grid Electrification, Bonna	*X*	*X*
Municipality Owned Diesel Off-Grid Electrification, Bonosha	*X*	*X*
Community Owned Off-Grid Micro-Hydro Scheme, Yaye	*XXX*	*XX*
NEPAL		
Micro Hydro Scheme, Ghandruk	*XXX*	*XXX*
Small Hydropower Scheme, Tehrathum	*XXX*	*XXX*
SRI LANKA		
Micro Hydro Projects in Hettikanda and Handunella Villages	*XXX*	*XXX*
Solar PV Home Systems, Uva Province	*XX*	*XXX*
UGANDA		
Mini-grid from Diesel Genset, Magale Village	*XX*	*X*
Micro Hydro System, Kisiizi	*XXX*	*XXX*
*[**KEY:** X - weak XX - medium XXX - strong]*		

Figure 4: Summary of case studies carried out

It can be seen from this summary that both successful and unsuccessful projects have been assessed, providing useful lessons not only in terms of "best practice" but also "worst practice."

DIALOGUE AND ENGAGEMENT

Bringing stakeholders together can be extremely informative about their various needs and priorities. The project used a "learning by doing" engagement approach, taking possible new project opportunities and supporting their development towards bankable business proposals.

A number of events were held in Ethiopia, Nepal, Sri Lanka, Uganda and the UK in order to ascertain opportunities and barriers to widening electricity access and bringing further livelihoods impacts on the poor.

[2] All case studies are appended to the Country Guideline documents and are also available on the project web site

The next section in this document will summarise the key findings of the project. This forms a summary of lessons learned from each of the countries assessed.

LESSONS: MAXIMISING SUSTAINABILITY AND IMPACTS

GENERAL

This section outlines some of the main lessons learned from all four countries in the PACE project. The purpose of this is to identify common themes that exist between the countries and provide some guidance on how best to apply knowledge gained in future development activities.

It should be noted that some of the guidance presented appears on paper to be relatively uncomplicated in nature. Yet it is obvious that in each of the four countries assessed, there are some seemingly straightforward issues that do need to be addressed against a background of complex historical and policy contexts. For instance, how can community projects develop in the absence of appropriate legal or regulatory frameworks?

Commonly, options to resolve these issues lies with larger interest groups, primarily government institutions, but these are also related to the activities of active donors. Further, these issues can often be associated with broad political and business agendas. Electricity access is well known to be a political bargaining tool.

Note that this project did not take on the task of exploring or advising on solutions to such wide agendas, but attempted merely to suggest appropriate and useful lessons learned about how good, sustainable projects can be enabled, and how those projects ultimately affect livelihoods. It must however be recognised that political positions in terms of electricity sector reform and the like have an overwhelming bearing on the opportunity for, in particular, private sector involvement in project development. For example, the private sector must see clear “entry points” (such as financial incentives) in a market if their participation is to be initiated and developed.

More detail on individual lessons learned, and livelihood impacts, can be found in the individual country guidelines for Ethiopia, Nepal, Sri Lanka and Uganda.

Within the context described above, the sections below provide a summary of the partnership and livelihood considerations that should be considered by core stakeholders when considering the support of electricity programmes. The sections are divided into the core components of the project development process (see figure 1 above) and examples from real cases are provided for each part of the development process.

Note that these sections are not intended to be exhaustive but are here to highlight some of the important issues that communities and developers are confronted with.

PROJECT CONCEPT

As the initiating stage of all projects, this component is of critical importance. First questions arise and are driven by different stakeholders. The “who, why, where, what and when” questions are all asked and different partnerships come together to take things forward. There is a need for a clear and common understanding so that all partners are on board from the outset

It is a critical part of conceptualising what can and should happen. Community mobilisation and communications are very important.

Tasks	Partners	Pro-poor considerations	NEEDS
Problem identification (present and future need assessment) *Coordination: Multi-sector approach* *Community mobilization* *Maximizing the potential use of electricity for livelihood benefits*	*Community, CBOs/NGOs, local development associations,* *Local government* *Private sector service providers*	*Sector institutions should be encouraged to maximize service provision through potential electricity supply, for example by holding evening classes in schools to widen access to education, provision of better health services for longer hours, etc. (See Box 2)* *Opportunities for new income generation activities need to be researched, and skills and training needs assessed.* *Private developers may require incentives for concepts to move forward (See Box 1)*	*A coordinated effort for making electrification projects financially feasible at a national level so that projects become attractive and bankable.* *Awareness-raising needs to be carried out to promote the benefits of income generation for local development.* *Information and promotion of new appliances should be available to ensure that people are aware of costs/benefits and can make informed choices.*

Examples:

Sri Lanka: Enabling Solar Home System roll-out

Even in a resource-constrained environment, local authorities can play a key role in delivering electricity to communities

To meet their objective of improving access to electricity in the province, Uva Provincial Council decided to divert their budget for grid extension to the provision of subsidies for the purchase of household solar PV systems. At a rate of Rs10,000 (£67 sterling per unit), they calculated that they would be able to part-finance 45,000 units in five years. In addition to this financing role, they have also ensured that high levels of service to households are maintained, through a monitoring process. This has brought safety and quality benefits to the consumers and has strengthened the reputation, both of solar energy itself, and of private sector technology and service providers amongst the local people, some of whom had a poor experience with solar home systems in the past.

Uganda: Planning for community health benefits

Strong public private partnerships can enhance project success

The Kisiizi Power Company, which is a partnership between the local community, the hospital, government and donors has attracted much interest and support from the different stakeholders, and is likely to be one of the first companies to receive a subsidy from the Uganda Energy for Rural Transformation programme.

The company aims to upgrade the current 60KW capacity hydropower plant to 300KW so that there is enough electricity to supply the Kisiizi Hospital and the village community.

FEASIBILITY

Critical to the success of a project is identifying and involving the right stakeholders at the right time. Once a project has been conceived, there are a large number of technical, financial, management and ownership implications that require full consideration.

It is at this stage that partnerships form to spread the risk and rewards of the project. The ultimate livelihoods benefits to the community, including improved health, education and economic benefits are primarily determined at this stage. The process is often iterative, and involves a significant level of interface between partners.

Tasks	Partners	Pro-poor considerations	NEEDS
Consultation and Feasibility studies	*Private sector service providers, consultants* *Community /NGO/CBO* *Local govt.* *National Government (policy and incentives)*	*Partners should facilitate a planning process that includes:* *Research of local priorities of needs* *Stakeholder participation* *Assessment of existing/future electricity needs* *Identify potential electrification options* *Selection of scheme based on whole community's needs and interests. (See Box 3)* *Scope technical & financial implications of providing an electrification system that could deliver those services.* *Assess community's willingness and ability to pay (See box 4)* *Assess opportunities for income generation and its implications for the feasibility of the electrification*	*Guidance on various participatory techniques.* *Tools for assessing electricity generating potential (hydro, wind, PV)* *Guidance on how to integrate income generation with electrification schemes* *Tools for assessment of electricity demand associated with services.* *Guidance on how to undertake socio-economic analysis.* *Consideration of how successes and failures will be reviewed (monitoring & evaluation)*
System design	*Technical design assistance. (consultant, private sector)*	*Common standards and regulations for electrification systems should be developed to protect consumers and clarify legal issues. This can also reduce costs and maintain quality standards*	*Information on design aspects should be available through an obvious source, for example the regulator.*

Ethiopia
Public-private partnerships have provided a strong basis for problem-solving

The electrification scheme in Yaye is characterised by a good balance of public and private stakeholder roles. A local NGO helped the community to secure a loan for purchasing and installing a turbine and a generator, and a local private company undertook the installation. Also important was the role of the local council, who mobilized the community to contribute to the project, both financially and through provision of their labour. The project is currently administered and managed by a local development corporation.

Although payment defaulting occurs, affecting the ability of the scheme to raise sufficient revenues for maintenance, the strong partnership increases the chances that problems will be solved. In some cases, defaulters are disconnected to force them to pay their arrears. The plan is to transfer the management of the scheme to the community or local authority. In this case, the balance will be disturbed and, unless capacity is built in the community, the long term sustainability is at risk.

Sri Lanka

Extending livelihood benefits beyond connected households

Systems such as micro-hydro plants have the potential to power a broader range of facilities than solar home systems. In the case of the Kitulgala village hydro project, in the Sabaragamuwa Province, benefits are already being extended to those members of the community who are not directly connected to the system.

With few institutions or commercial enterprises, the community can still provide free electricity to the local temple and offered a temporary connection to unconnected households when there is a special occasion, such as a wedding or funeral. A battery-charging service has been established, and refrigeration benefits are being shared within the community. Currently, the full capacity of the system is not being utilized during the daytime, presenting an opportunity for initiating new income-generation activities that will use the electricity during that time.

With so many villagers employed in the tea plantations, increasing household incomes is not such a high priority for this community. However, the opportunity to diversify the local employment base, reduce dependence on services from the nearest town, or retain young people in the village may be more compelling drivers for maximizing the economic potential of this unused capacity.

FINANCE AND IMPLEMENTATION

The critical issue for projects is often taken to be finance. Finance to fund rural electrification projects is often difficult and expensive to obtain, or lacking for most rural communities. However, in some circumstances communities can be very resourceful and organised in terms of raising finance (see Ethiopia and Uganda case studies for examples). It is also well documented that 100% grant funded projects have a poor level of performance in the longer term. Projects without significant local contributions to overall capital costs usually suffer from dependency and a lack ownership. Hence, they often fail. On the other hand, projects that involve significant local participation, even if such contributions are in the form of labour and in-kind inputs (eg building materials, parts, etc.), tend to be more successful than those that do not.

Of considerable significance can be the wider planning and policy environment. The setting up of appropriate policy should encourage ownership and local stakeholder involvement. In many cases a significant level of institutional support from donors and governments, such as regulatory, policy, technical assistance, promotion, training, capacity building, is necessary over the medium term.

Tasks	Partners	Pro-poor considerations	NEEDS
Raising Capital	*Private sector service providers (Consultant) Community /NGO/CBO Local govt. National Government (policy and incentives Lenders and equity investors*	*Donors and other institutions should specify pro-poor measures when providing funding for electrification. (See Box 6) A proper planning process should ensure that private finance fully responds to the needs of the community, maximizing benefits through wide access. This may involve reducing risk to investors to encourage investment, employment creation, and so on (See Box 5) Communities can be very effective at raising capital. Business plans that do not fully plan for maintenance lead to financial failure. Long-term commitment of private sector as partner in the community needs to be encouraged to promote investment*	*Communities require information and guidance on how to utilize their funds wisely for electricity provision, and how to access additional finance Guidelines need to be developed with advice for business planning and a range of possible financial models that ensure the financial sustainability of a scheme. Develop novel and innovative financing methods eg microfinance techniques for larger projects, revolving funds, specialized Energy Banks etc*
Tariff preparation	*Private sector, community*	*Assessment of community's willingness and ability to pay Transparency in tariff setting and adjustment avoids mistrust*	*Socio-economic studies should be undertaken to assess factors such as local income levels and ability and willingness to pay. Guidelines for tariff preparation need to be prepared that offer a range of models appropriate for different types of system.*

Nepal

Strong institutional support made all the difference alongside community efforts.

Electrification of Ghandruk village in Nepal was spearheaded by a non-governmental organization, Annapuma Area Conservation Project (ACAP) which joined hands with local leaders in 1990 to mobilize financial resources for the construction of a 50KW hydropower plant.

Apart from improving quality of life, the project was expected to boost ACAP's efforts to combine tourism with sustainable resource management through reducing fuel wood consumption by tourism businesses. The organization gave the community a loan for the project, and also provided training in the design and management of electricity projects. In general, ACAP provided technical, financial and administrative assistance for the project, and also contracted a resident engineer for two years to assist the project in utilizing electricity for cooking. Significant institutional support is sometimes necessary for long term sustainability of projects

Sri Lanka

The role of planning in ensuring wide access

Uva Provincial Council has an active solar home system programme but recognises the limitations for livelihood improvement. For this reason, the Council is also undertaking a strategic plan to assess local hydro, wind and biomass resources and identify potential sites for further electrification projects.

Combining this technical aspect of planning with the ongoing consultation work that is being undertaken by the Rural Development Society (part-funded by the Council) on local needs and aspirations in the Province will be an important step to identifying appropriate systems that respond to the needs of individual communities.

In some cases, solar home systems may be an adequate means of meeting local energy requirements, or may be useful in supplementing other electricity generation, whilst in other communities the need to improve education, health or employment opportunities may justify additional investment in higher capacity systems that will bring electricity to schools, hospitals and local businesses. A sustainable planning process is the first step in ensuring that the benefits of electrification reach the poorest in communities.

MANAGEMENT, OPERATIONS AND MAINTENANCE, AND REVIEW

Modalities for management, operations and management (O&M), and review (eg monitoring and evaluation, benchmarking, impact assessment, etc.) should be established at the feasibility stage. There are clear historical lessons showing that this is an absolutely essential part of project design. Yet it is remains the one of the most significant issues for projects that reach full implementation stage.

Typically, grant led or "top-down" projects tend to neglect this area because sustainability happens through long term engagement of partners. Usually, grant providers do not want to remain involved in the long term.

Conversely, community driven or "bottom-up" projects neglect this area because they often do not understand the true costs associated with running capital equipment. A balance is therefore required – inexpensive finance (eg soft loans, "smart subsidies", capital grants, etc.) must often be made available, but a key partner must have enough of an incentive to deliver services over the long term and must be able to generate the right level of income to do so.

Process	Tasks	Partners	Pro-poor considerations	NEEDS
Management	*Managing the scheme in a sustainable manner, including revenue collection and fund management*	*Private sector, community, municipalities*	*Communities can manage small electrification schemes through community representatives, but need management support.* *Some local authorities have institutional capacity, but these must be separate from other municipal functions.* *The private sector can provide efficient management leading to a profitable system. Quality of service is important to generate revenue. Consumers are quality-sensitive & have even higher expectations from the private sector. (See Box 7 & 9)*	*Support communities and local authorities in effective and transparent management systems.* *Guidelines for developing a management system.*
Operation and Maintenance	*Operate the system.* *Carry out regular and major maintenance as required*	*Community, private sector, municipality*	*Party responsible for O&M must carry out maintenance fully and efficiently* *Quality of service and sustainability of projects are entirely dependent on good O&M (See Box 9)* *Possible technical failure of system results in loss of service at communal service points such as schools and clinics*	*Awareness of risks and benefits associated with maintenance.* *Technical training to ensure systems are maintained.*
Review	*Take lessons from project and feed them to national and international best practice*	*Participants to have a role consistent with their responsibilities / stake in project*	*Best practice needs to be well defined at all levels. Key stakeholders, particularly at policy making level, must be well informed about pro-poor considerations, successes and failures (See Box 8)*	*National and international review mechanisms which identify best (and worst) practice.*

Ethiopia

Attitudes towards partnership with the private sector

Lemi is a rural town in Amhara Regional State. As part of the development programme in the region, a generator was provided by the regional government. The system and mini-grid was installed by the national utility EEPCO. It was initially assumed that EEPCO would take over all the management and operation of the scheme.

With EEPCO declining to take responsibility, the local community approached a private company for lease contract which include management and operation, tariff setting and bill collection. Fearing the difficulty of collecting monthly bills and possible power pilfering, the private company proposed that its involvement would only be in operation and maintenance. Lemi community had agreed with the proposed contract but the attitude of the regional government body that provided the fund for the electrification of the town was not positive towards such sort of partnership with the private sector. Lemi town still is not electrified.

Nepal

More women than men reported livelihoods improvements following electrification.

Most women in Tehrathum, which received electricity through a micro-hydro scheme, attributed the improvements in their livelihoods to electricity.

They reported that it had made life easier especially after the number of mills in the village rose to seven. Prices for services such as rice hulling fell which meant that more households could now afford to use them. At the same time women no longer spent long hours doing this work manually, and could afford to engage in other productive activities.

Uganda

Absentee landlords and professionals returned & settled in Magale village after electrification.

When Magale village got electricity in 1999, absentee landlords who had spent years without visiting the village returned and built houses for renting by the professional teachers and health workers who took jobs in the village schools and hospitals because of the availability of electricity.

Poor farmers benefited from the influx to the village of richer people who bought their food crops. Electrification opened up new markets for the farmers and facilitated diversification of income-generating opportunities for those branching into petty trade activities. Farmers who could not afford to have electricity in their homes were at least able to increase their incomes, and could more easily access health and education services especially for their children.

However, the project ultimately failed due to a) mistrust over cost of service and b) quality of supply through design and maintenance issues.

THE WAY FORWARD: GUIDANCE FOR PROGRAMME SUPPORT

GENERAL

The country guidelines developed through PACE provide specific country examples of appropriate interventions and support. Specifically, they indicate what can be done to further develop electrification programmes in such a way as to provide wider access and increase livelihood impacts.

This final section of the International Guide focuses on how government stakeholders and donor programmes can contribute to aspects of rural electrification programmes in such a way as to improve access and livelihood aspects.

RECOMMENDATIONS

Partnerships, livelihood impacts and income generation: Further work is required on how to go about planning and design of country programmes and individual electricity projects in order to maximise impact on livelihoods. This study has tested the emerging paradigm of public private partnerships in the context of decentralised electricity in developing countries. However, little work has been done at this level in a sustained fashion. To address the Millennium Development Goals, it is crucial to attempt to understand the complex dimensions of energy and poverty alleviation in order to best direct government and donor resources.

In particular, a better understanding is needed of the way in which to plan for income generation activities and to consider the contribution of projects to sustainable development criteria. Much of this work will need to be done at national and local levels as local contexts are so different. Involvement and engagement of CBOs, NGOs and business associations as well as government stakeholders is important to get the critical mass of "buy-in."

Cross sector issues: Electrification alone will not stimulate a rural community economy. There has to be an adequate policy and infrastructure framework such that electricity can improve livelihoods and contribute to local economic development. There have to be markets for produce, access to markets through roads and telecommunications and people trained to be entrepreneurs and developers. Therefore, at a policy level, electricity must be seen as an essential but insufficient condition for development. Governments, donors and others involved in this field must recognise this and develop support programmes that fully integrate cross sector aspects[3]. (Longer-term impacts on livelihoods generally come through better education, health, employment and income generation, revenue generation for local authorities, and so on.

In keeping with the central government's developmental goals to eradicate poverty, it can also focus on developing rural electrification programmes with a view of economic and livelihood development of rural areas. Central governments can link the cross-sector energy requirements by coordinating agriculture (water pumping, drip irrigation, chilling of produce, processing etc.), communications (internet, telecoms, ICT), education (distance education, adult education, vocational training etc.), and health care (refrigeration etc.) sectors.

Projects planners that play a coordinating role either through existing local development associations or NGOs should be encouraged for a pro-poor and wider access to electricity which maximises livelihood benefits. Development of a methodology to promote full consideration of these issues is essential if the poverty eradication potential of electricity is to be harnessed (see also "Local Resource Planning"- below).

[3] An example of one approach is the Energy for Rural Transformation Programme (ERT) in Uganda – see the Uganda Country Guidelines for more details of how this is structured

Knowledge Exchange[4]: Dialogue and international exchanges, when targeted and appropriate, are usually successful in supporting policy makers and private sector participants. Both the invitees to events and the PACE team themselves have noted significant benefits in terms of understanding of the issues and lively exchanges of ideas about programme development. Other initiatives are already active in promoting this kind of exchange. Global Village Energy Partnerships (GVEP) and the South Asia Regional Initiative for Energy Cooperation and Development (SARI-Energy) are good examples.[5]

Donors and development organisations must develop an understanding of the extremely varied country contexts, as has been illustrated by the PACE project. Although similar issues are faced by many countries, there is certainly not one formula or solution that will suit. Experience of one country can be applied in or adapted to another, but a "one-size-fits-all" mentality can be counterproductive. Donors can and should provide incentives for participation of stakeholders in donor dialogue and programmes. Often donors simply expect that stakeholders will voluntarily attend meetings and events, without any consideration of stakeholders' opportunity costs or direct costs.

Support for sector associations and "project packagers": Critical in the priming and roll out of projects is the role played by associations and "project packagers." Usually, development of a sector in the early stages is driven by a very small number of committed individuals who may or may not be part of a business association or government department. These stimulate market development and can support developers as they venture into new markets.

Best Practice Demonstration Projects: Donors supports should extend beyond knowledge and research to supporting equity financing of community electrification schemes through public-private partnerships Pilot projects that could be models for further replication are particularly valuable in regions where very little rural electrification has taken place to date. Direct support of individual project ventures is not critical but a focused "piloting" strategy to get some projects started may be more successful in the short term than a broad competitive programme in countries LDCs like Uganda and Ethiopia where the private sector is very weak. It is particularly important to have flexibility built into the system that allows stakeholders to innovate freely.

Local Resource Planning: An option for addressing local development options at source is the concept of local resource planning. This involves supporting local government in identifying, prioritising and supporting the implementation of local projects in the widest sense. First of all, development opportunities and priorities are explored including farming, health, industry and commerce within the context of local natural and human resource opportunities. With this holistic and broad based approach to development, and with appropriate consultation of local communities and business, plans and opportunities for local development can be drafted.

Integral to these plans is the extent to which energy and electricity may be important and how that component of development can be integrated. All activities require energy to a greater or lesser extent, whether water for irrigation, electricity for clinics, or energy for powering local industries and businesses. The links to government programmes must be integrated so that local government can take maximum advantage and meet local development needs. This process requires a level of capacity that is often not found in local government. Therefore, support and capacity building measures are required.

Electricity Sector Reform (Also see "Finance" below): For countries undergoing power sector reform, with increased participation from the private sector, there are now an increasing number of possibilities to fully incorporate off-grid solutions in parallel with grid supply plans. If this stage of reform is not handled correctly, the off-grid sector can be affected such that rural communities may never have access to electricity at a reasonable cost. (For instance, the unbundling of grid supply and related policies may be developed without true consideration of solutions for the rural areas) All countries have some form of off-grid projects in place. The government must therefore engage all the

[4] Also see Annex B for a list of useful documents that are available through the PACE web site
[5] See Annex A, which provides links to more information on these and other initiatives

affected parties in a transparent dialogue, and ensure that off-grid options are not left behind or ignored. Rural zones can often be politically weak. Government support is necessary to achieve this dialogue, involving recognition of the importance of the restructuring process for rural communities.

Human capacity: As well as developing skills to develop and run cross sector electrification programmes, skills are required at a technical level. For example, public sector institutes to produce the necessary trained manpower may be necessary in order to build and operate electrification schemes. The increased employment opportunities will have a positive impact on livelihoods. A better trained workforce will also mean that power systems run more efficiently with an associated positive impact on livelihoods and the economy. A pool of skilled, specialised manpower is necessary to develop a thriving private sector in electrification.

Finance: Finance is the key to increasing access to electricity. Any policy of electrification must spell out clearly where the money is going to come from. Regardless of the scale of a central initiative, a core electrification fund can be a particularly clear and useful approach. Ideally, this is in the form of a levy put on the present consumption of grid electricity.

Financing from commercial banks must also be leveraged to increase the level of funding available and to increase long-term sustainability. The involvement of commercial banks means that there is a check on whether the money is spent efficiently and whether the schemes are financially viable. Other forms of raising finance such as bonds, grants and soft loans from bilateral and multilateral donors can be considered as appropriate, in parallel with community or micro finance initiatives.

Mobilising private finance is essential but challenging, as the commercial finance sector is often unfamiliar with off-grid rural electrification. While they may engage in considerable financing of large-scale energy projects, small-scale, rural, off-grid investments pose particular risks, ranging from security of lending (eg collateral), to cost recovery (eg appropriate tariff setting). To be fair, rural commercial lending for any investment, not just in the electricity sector, poses high risks to commercial banks.

However, without commercial financing, rural electrification, and private participation in that as a key partner, will not take place. Numerous options are available to reduce commercial risk, and attract the commercial banking sector to participate in investments in rural electrification. A key is for donors and government to set up mechanisms (such as rural electrification funds) to reduce the amount of commercial borrowing required and to help mitigate risk.

Further, government subsidies and grants (up front on capital investment, not on recurrent costs), technical assistance, promotion, capacity building, training of investors and consumers can go a long way towards encouraging private sector investment, and provide the commercial banking sector with assurance that mitigates risks. However, strong linkages and positive engagement is necessary to guarantee viability and sustainability of projects.

Electrification technology and materials: In order to bring down costs and maximise wider positive livelihood impacts there must be a policy of localising electrification technology and maximising the use of local materials and products. A systematic study of how to achieve this in the most effective way is needed for countries with particularly significant natural resource options (like micro-hydro), although it may not be relevant in all countries.

Policy and Regulatory Framework: A “National Electrification Policy” which lays out the vision and modalities for achieving national electrification is essential in order to have a common platform and goal for all those involved in electrification. In the absence of such a policy, efforts and activities of the diverse stakeholders will be ad hoc. In order to support this policy a regulatory framework is required for the growing private sector involvement in rural electrification projects. The increasing number of private organisations participating in community electricity projects demands consistent regulation and regulatory support (eg information, technical assistance, capacity building) by government. This can

clearly be supported by donors. Setting tariffs to ensure cost recovery for investors and protecting consumers, in both a financial and physical sense, are equally important.

The rural or off-grid sector must not be neglected within the regulatory framework. A key to this is the policy of "light-handed regulation", in which the regulator leaves much of the decision making for approving projects, for approving tariffs, and so on, to local authorities, to designated agencies, etc. This is particularly important in an increasingly decentralised governmental context but it must be accompanied by strong efforts on the part of regulators, and the donors supporting them, to build up the right capacity and technical expertise.

Without a good regulatory environment that promotes investment in rural electrification, particularly isolated, off-grid rural electrification, investment will not take place. A careful balance between encouraging investors and commercial financiers in the sector and protecting and promoting consumers' interests must be struck. There is a substantial role for donors to play a part in this process, as demonstrated in Uganda, Nepal and Sri Lanka.

There must be adequate encouragement for off grid investors since these are generally in the more isolated and poorer parts of the country. Returns on investment will be lower and risks will usually be higher in these areas compared to grid-connected areas. The central government can partner, or better still demarcate responsibilities, with the provincial or regional governments, as they are closer to their constituencies. To do so, they must build up these governments' capacities to promote and support rural electrification.

Importantly, in the process of the restructuring, government has to see the rural electricity sector from a very broad perspective. This is especially true, as governments and donors alike are linking rural energy to sustainable livelihoods and poverty alleviation. The electrification process is usually driven by people in the utility and ministry who may only embrace the traditional grid extension paradigm. In countries which need other partners from the private sector, banks, NGOs and the end users (as many as 20% of communities may never be grid electrified), regulation has to be sensitive to all these new players, with a common objective of providing quality energy services to people at a reasonable cost. Therefore, it is crucial that governments not act in haste, at this time of change, but look at this very carefully to ensure that the most effective measures are implemented.

With private sector involvement, government cannot simply expect that regulations will do their work and deliver their development objectives. They must identify priorities and ensure that an environment of fairness and equity can develop. Often the private sector lacks the capacity and finance to implement projects, so checks must be made in order to appropriately support their activities. Ultimately, clearly set out policy and programmes at the national government level need to be made transparent and public. This enables lower levels of government at regional, district and village level, individuals, NGOs, CBOs and other organisations to assess how long they may have to wait for electricity and what initiatives they may want to take to speed up access.

The diverse experience and approaches of the four countries studied during the PACE project has provided valuable insights into issues of electrification and impacts on livelihoods. The four countries are at different stages of achievement regarding electrification, have their own perspectives and have made their own choices about how to move ahead. These differences are one reason why there is such a rich set of lessons that can be confidently taken forward into new work. There are clear lessons to be learned, and the PACE resource will go on to support decision makers in a range of settings.

However, there is more work to be done in the areas described above. This is because there is little doubt that the growing involvement of the private sector in developing country service delivery is an issue that requires considerable attention. Particularly, the opportunity for supporting the Millennium Development Goals lies at the feet of a wide range of stakeholders, many of whom are not familiar with the energy sector.

The poverty alleviation aspects of electricity access are known to be complex, linked as they are to service delivery in health, education and local economic activity. Yet, there are many exciting and innovative possible partnership arrangements for wider electricity access. A number of basic principles, tools and areas for future work have been clearly identified and it falls principally to policy makers at national and international levels to continue to evolve their strategies.

Annex A - Further Information

The following programmes and portals are relevant:

id21

id21 is a fast-track research reporting service funded by the UK Department for International Development (DFID). It aims to bring UK-based development research findings and policy recommendations to policymakers and development practitioners worldwide.
http://www.id21.org/

Livelihoods Direct, UK

Guidance, tools and links on creating sustainable livelihoods for poverty eradication.
http://www.livelihoods.org/

Global Village Energy Partnerships (GVEP)

A voluntary partnership that 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. http://www.gvep.org

UNDP - Public-Private Partnerships for the Urban Environment (PPPUE)

Supports the development of innovative partnerships between public and private actors at a local level
http://www.undp.org/ppp/about/index.htm

European Union Energy Initiative (EUEI) for Poverty Eradication and Sustainable Development

The objective of the Initiative is to contribute to providing the access to energy necessary for the achievement of the Millennium Development Goals. http://www.euei.org/

Renewable Energy and Energy Efficiency Partnership (REEEP)

A coalition of progressive governments, businesses and organisations committed to accelerating the development of renewable and energy efficiency systems. http://www.reeep.org/

The Ashden Awards - Ashden Trust, UK

The aim is to identify outstanding renewable energy projects that will help to alleviate poverty, improve the quality of life and protect the environment, while remaining responsive to existing cultural values.
http://www.ashdenawards.org/int_2004.html

Shell Foundation

Catalyses partnerships that deliver sustainable solutions to those social and environmental challenges in which the energy industry and multinational corporations have a particular role. http://www.shellfoundation.org/

The National Council for Public Private Partnerships (NCPPP, USA)

Advocates and facilitates the formation of public-private partnerships. Not development focused, but with useful guidance on PPP principles. http://www.ncppp.org/

Global Compact (UN)

Seeks to advance responsible corporate citizenship so that business can be part of the solution to the challenges of globalisation. A) Mainstream nine principles in business activities around the world; B) Catalyse actions in support of UN goals. http://www.unglobalcompact.org/Portal/Default.asp

The South Asia Regional Initiative for Energy Cooperation and Development (SARI/Energy)

Promotes mutually beneficial energy linkages among the nations of South Asia
http://www.sari-energy.org/

Annex B – Useful Documents

The following documents are available to be downloaded through the PACE web site: http://pace.energyprojects.net.

There are many other documents available including presentations and reports from activities completed during the PACE project. These are useful to a variety of key stakeholders and provide some more specific detail on country policies and measures.

	GUIDES	DESCRIPTION
G1	Users Guide to Off-Grid Energy Solutions	Web - based guide to energy needs and solutions
G2	Photograph Guide	Photograph guide to illustrate typical energy products and services. The guide contains the more common off-grid and on-grid energy appliances
G3	Tariff Setting Guidelines	Guidance on Tariff setting for sustainaibility in Micro-hydro projects
G4	Livelihoods analysis	Guidance on integration of livelihoods analysis in electrification project development
G5	Types of Public Private Partnerships	Description of the different forms of Public Private Partnership arrangements commonly in existence
	SPECIMEN AGREEMENTS	DESCRIPTION
S1	Specimen Micro-hydro Constitution	Example of a constitution between members of a micro-hydro project development for Micro Hydro power Generation and Consumer Co-operative Society
S2	Specimen Lease Agreement	Agreement between a Lessor and Lessee for a typical micro-hydro project
S3	Specimen PPA	Power Purchase Agreement for independent power projects
S4	Specimen electricity consumer agreement	Example consumer agreement for sale of electricity

Part II: ETHIOPIA

By

MGP Consultants Ltd

Contents: Part II Ethiopia

INTRODUCTION

Exploring ways of improving access to electricity is essential for poverty reduction and, with the emergence of service delivery through public-private partnerships, there is a growing concern that only the wealthiest members of communities will benefit. The PACE project[6] has been reviewing existing public-private partnerships in small-scale electrification projects in four countries, and developing an understanding of what is required to ensure that community-based electrification is both sustainable and able to deliver livelihood benefits to all social sectors.

Focusing on Ethiopia, this document is one of four sets of National Guidelines that represent the key outputs of the PACE project. The other guidelines are for Nepal, Sri Lanka and Uganda and the lessons from all four countries have been compiled into an International Guide, which is aimed at international stakeholders actively involved in community electrification and poverty reduction programmes or projects.

The main objective of the PACE project is to assess how Public-Private Partnerships for off-grid Electrification, within the context of Ethiopian electricity sector reform and existing electrification programmes, can contribute to wider electricity access for poverty reduction targets, and to outline mechanisms to scale up direct and indirect access to electricity to improve livelihoods and income opportunities.

In summary, this guide covers:

- The status of electricity sector reform and implications for poverty reduction
- Overview of current rural electrification activities
- Recent lessons
- Guidelines that will help ensure wide access at key stages of electrification projects
- Recommendations for removal of remaining barriers to decentralised electrification

Note that further detailed information regarding the Ethiopia electricity sector and context is available on the project web site.[7]

[6] The PACE project has been funded by the UK Department for International Development (DfID).
[7] See "Supplementary Note, Ethiopia Electricity Sector" which is available from http://pace.energyprojects.net

STATUS OF ELECTRIFICATION AND ELECTRICITY SECTOR REFORM

The Ethiopian Electric Power Corporation (EEPCO) is a limited liability public utility engaged in the business of generation, transmission, distribution and sales of electricity and, until the 1997 power sector reform, this utility monopolised Ethiopia's electricity sector. The legal basis for involvement of the private sector in electricity provision came in 1997 with the publication of two documents: the electricity proclamation (no. 86/1997) and regulations (no 49/99). Whilst allowing for private sector participation, these secure the right for electricity transmission on the national grid solely to EEPCO.

Despite this, EEPCO is still the only utility that supplies electric power to the nation, with the exception of very few privately or municipality owned generator sets, and a couple of community micro hydro schemes that supply power to small rural towns in isolated mini-grids.

The total installed capacity of electric supply by EEPCO is 521MW, of which over 98% is from hydropower. The national grid (the Inter Connected System) serves most of the larger population and commercial centres, but many medium size localities receive only a part-time, unreliable service from diesel generators which are operated as part of the self-contained system (SCS)8.

1898	*Emperor Menelik II acquired a generator to light his palace*
1936	*The Italian company, Campani Nazionale Imprezi, is granted the right to generate, distribute and sell electricity in Ethiopia.*
1948	*Shewa Electric Power is established by the Ethiopian government to take over generating, distributing and selling electricity to the then town of Addis Ababa and its vicinity.*
1955	*Ethiopian Electric Light and Power Authority (EELPA) was established for the purpose of generating, transmitting, distributing and selling electricity throughout the country.*
1997	*Following a restructuring process, EELPA is reorganised and becomes the Ethiopian Electric Power Corporation (EEPCO) which is responsible for generating, transmitting, distributing and selling electricity nationwide.*
1997	*Formation of the electricity regulatory body - Ethiopian Electric Agency, and legislation to allow private sector participation in the electricity sector.*
2003	*Formation of Rural Electrification Fund (REF), Rural Electrification Board (REB) and Rural Electrification Executive Secretariat (REES) under the Ministry of Rural Development (MoRD).*

Table 1: Milestones in the History of Electrification in Ethiopia (Source: EEPCO)

Despite the fact that electricity was introduced into Ethiopia not long after its discovery, access to electricity is limited to only 6% of households and 13.4% of the population with an estimated consumption per capita of 25kWh. The high proportion of the consumers that have access to electricity are concentrated in the main urban areas of Addis Ababa, Nazareth, Dire Dawa, Harar and their surroundings, together accounting over 80% of the consumption. According to CSA 1994 census report, only 61,000 households or less than 1% of rural population have access to electricity.

Until recently, EEPCO did not have a dedicated unit for rural electrification, which was carried out as part of the conventional, continuous expansion of the grid, through a project approach. The rural electrification programme was initiated for the first time in 1994 by the Canadian consulting firm, Acres.

[8] EEPCO web page

This programme proposed an ambitious 20 year rural electrification programme known as the Ethiopian National Rural Electrification Project (ENREP) through a continuous expansion of the grid to the rural areas of the country. The study by Acres concluded that this approach to rural electrification might be economical but, with such a slow expansion rate in electricity, 96% of the rural population of Ethiopia would still remain without a conventional electricity supply by the end of the project in the year 2011[9].

Land Area	*1,098,000sq km.*
Location	*Northeastern Africa (Horn of Africa)* *30 – 150 N of Equator*
Climate	*Temperate on plateau and hot in lowland*
Temperature	*Highland – 20°C (68°F)* *Lowland – tropical climate*
Rainfall	*Average 250mm* *Main rain season - June – September* *Lesser annual rainfall – February – April*
Population	*70.1 million*
Population Growth Rate	*2.92*
Urban Rural Population Matrix	*15% Urban/85% Rural*
Economically Active Population	*14-60 years of age (50% of population)*
GNP per capita	*US$110*
Inflation Rate	*4.8%*
Literacy Rate	*32.8%*
Electrification of Population (%)	*13.4%*
No. of households connected to electricity	*534,106*
Total number of customers to EEPCO	*680,325*
Power generation Installed Capacity	*521MW*

Table 2: Demographic Data (Source: The Dynamics of Economic Reforms EIIPD, 2001; EEPCO, Facts in Brief, 2001; EEPCO webpage)

The government has since realised that conventional approaches to rural electrification, which emphasize continuous extension of the grid, are neither economically feasible, nor are they in conformity with government's rural development strategy, which seeks to widen electricity access and use it as a driver for rapid and sustainable socio-economic development in rural areas. It is in this context that the Government of Ethiopia (GoE) embarked upon power sector reform, including adoption of a new Rural Electrification Strategy, which takes all viable technologies into account and opens the door for private sector participation in the development of the sector. The driving forces for the reform included:

- The need to back up the rural sector with adequate energy supplies so that inadequate expansion of access to electricity service to the rural population will not be a bottleneck to the Government's long-term "Agricultural Development-Led Industrialization" (ADLI) Strategy
- The need to gradually remove subsidies to the power sector in order to reallocate resources to the other more pressing public expenditure needs
- Global trends that sway the utilities in terms of commercialisation, decentralization and liberalization of the power sector for reliable, sustainable and quality services provision through competition.

[9] World Bank ESMAP report no 179/96

The potential challenge to electricity sector reforms is that, unless carefully planned together with access programs, it is unlikely that they will widen access to electricity for the poor. This is particularly the case in issues such as tariffs and subsidies, reforms of which have the potential to slow down access initiatives by reducing subsidies and raising tariffs.

Following the power sector reform, the government devised a twin-track electrification strategy through the extension of the national grid, and the involvement of the private sector in a decentralised generation and distribution of electricity using isolated mini-grids in order to realise an accelerated rural electrification.

In response to the electrification strategy, the Central Government envisages the electrification of 210 district towns through the extension of the national grid in the coming two years. This will increase the number of towns which have access to electricity from 458 to 668. Institutional and financing mechanisms have already been put in place to facilitate the private sector-led rural electrification and will start functioning soon.

However, challenging issues will emerge during this period. With EEPCO extending the grid to major rural towns which have potential demand for electricity, remote and less attractive rural settlements will be left to initiatives by the private sector and NGOs through development of off-grid systems. There are some urgent requirements that will need to address the lack of market potential in those rural settlements. These are as follows:

- Adequate regulatory framework and enabling environment
- Awareness among communities and consumers
- Adequate planning and coordination
- Adequate technical skills and experience
- Engagement among stakeholders to discharge responsibilities
- Flexible and innovative financing mechanisms

These requirements have important implications for delivery of off-grid electricity through public-private partnerships.

PUBLIC-PRIVATE PARTNERSHIPS AND ELECTRIFICATION

As mentioned in the previous section, electrification in Ethiopia has mainly been implemented through extension of the national grid, with the exception of very few sporadic bilateral aid commitments and private sector initiatives.

In spite of the fact that there has only recently been a legal and regulatory framework to support and facilitate private sector involvement in generation and distribution of electricity, decentralised electricity provision is certainly not a new phenomenon. In rural towns, for example, it is not uncommon to find individuals generating electricity with small diesel or petrol generators for self-consumption and selling the extra power to the surrounding neighbourhoods. Because of limited resources, system capacities and service qualities of privately owned systems are usually kept to the minimum. This is in order to avoid exposure to risks that investment in improved service delivery involves. In most cases, private generation units are characterised by poor quality services, low performance and restricted access for consumers.

Currently, there are very few instances of partnerships between the public and the private sector in electricity service provision in Ethiopia. The most common type of public-private partnership is limited to works and service contract.

Many communities are still reluctant to develop rural electrification projects in partnership with the private sector. There have been cases where the private sector has declined requests of partnerships with the public sector fearing that it will be difficult to collect bills and control illegal connections. In other cases, local and regional governments' attitudes were not in favour of such a strong partnership

> *Lemi is a rural town in Amhara Regional State. As part of the development program in the region, a generator was provided by the regional government. The system and mini-grid was installed by EEPCO. It was initially assumed that EEPCO would take over all the management and operation of the scheme. With EEPCO declining to take the responsibility, the local community approached a private company for lease contract which include management and operation, tariff setting and bill collection.*
>
> *Fearing the difficulty of collecting monthly bills and possible power pilfering, the private company proposed that its involvement would only be in operation and maintenance. Lemi community had agreed with the proposed contract but the attitude of the regional government body that provided the fund for the electrification of the town was not positive towards such sort of partnership with the private sector. Lemi town still is not electrified.*

Box 1: Case Study experience: Negative attitudes towards partnership with the private sector

between those sectors. There have also been incidences where communities rejected qualified contractors and preferred to wait a few years for EEPCO to carry out the installation.

This situation is slowly changing. Private sector contractors have designed and installed electromechanical equipment and mini-grids (both for micro-hydro and gen-set schemes). This has happened in over a dozen communities over the past few years. This sort of public-private partnership model is becoming common practice in the present mode of off-grid community electrification. As public-private partnerships gain momentum, the experience being gained is becoming an invaluable resource.

The next section of these guidelines outlines the key lessons that have been learnt in some cases where non-conventional electrification projects have been developed with the involvement of various public and private actors. These identify areas in which more effort will be required to ensure the development of robust public-private partnerships for the development, management and operation of rural electrification schemes in the future.

RECENT LESSONS

Within the PACE project it has been possible to analyse the impacts of some examples of community electrification through public-private partnerships. Detailed case studies[10] were carried out in three communities to explore the following community electrification projects:

The case studies reveal the way in which the various actors have worked together to achieve these projects, and offer valuable lessons for other communities and electrification stakeholders – both in terms of successful implementation and, most importantly, livelihood impacts.

- Project implementation processes: initiation, finance, structure, levels of stakeholder involvement, tariff arrangements, management, maintenance and general sustainability.
- Livelihood impacts: Analysis of both direct and indirect access to electricity in the domestic, commercial and institutional sectors.

[10] Full versions of the case studies are available in Annex A

Case Study 1: *12kVA diesel generating set owned and operated by a local businessman, and used to supply 180 establishments with electricity for five hours each day in Bonna (pop. 10,003), a small rural town in the Southern Nations Regional State.*

Case Study 2: *170kW micro-hydro power plant owned by the community and managed by a private development organisation, delivering electricity to 320 households in the town of Yaye (pop. 4,555), the capital of Arbegona Woreda in Sidama Zone in Southern Nations Regional State.*

Case Study 3: *115kVa diesel generating set owned and operated by the municipality delivering electricity to 200 households in the town of Bonosha (pop. 2,855).*

Box 2: Case studies

Schemes must be sustainable before they can deliver significant livelihood benefits

In Bonna town, the power supply is of a very poor standard. The majority of complaints are related to the low voltage power that is delivered through an improvised distribution line with inadequate wiring on poorly erected thin wooden poles. As new customers are connected in the town centre, consumers at the far end of their town have terminated their contracts as a result of the voltage losses. Delays in responding to complaints and in undertaking repairs to broken lines were also reported as a major problem. In addition to this, there are strong perceptions of unfairness in the scheme, since consumers are charged even when electricity is not available.

Box 3: Sustainability

The key lessons learned within these case studies are described in the following section, with examples from the PACE research.

PROJECT IMPLEMENTATION

Schemes established without proper assessment and planning of the future market potential are likely to be either under utilised or oversubscribed, resulting in consumer complaint due to poor electricity services. Oversized systems do not only result in wastage of resource but are also vulnerable and likely to fail, because revenue obtained from operation might not be sufficient to cover operating expenses. This is particularly true with diesel systems.

Off-grid electricity schemes must first be sustainable before they can deliver significant and ongoing livelihood benefits (see Box 3). Financial management must make provision for future maintenance of the system. To ensure this, a clear management strategy must be in place and trained staff responsible for management of the system.

Though important, affordability is not always the main reason for the lack of a connection for households. Unreliability and a poor level of service can be more significant in preventing expansion of the household consumer base. Amongst connected households, many are willing to pay more for improved reliability.

Even when tariffs are set in consultation with the community, this can still lead to dissatisfaction if the quality does not live up to the agreed tariff rate. If tariffs are adjusted without transparency, this can lead to mistrust.

System capacities and service quality of privately owned schemes are usually kept to the minimum in order to avoid risks that investment on improved service delivery might involve. This is a 'false

Strong public-private partnerships provide a strong basis for problem-solving

The electrification scheme in Yaye is characterised by a good balance of public and private stakeholder roles. A local NGO helped the community to secure a loan for purchasing and installing a turbine and a generator, and a local private company called Sigma undertook the installation. Also important was the role of the local council, who mobilized the community to contribute to the project, both financially and through provision of their labour. The project is currently administered and managed by a local development corporation.

Although payment defaulting inevitably occurs, affecting the ability of the scheme to raise sufficient revenues for maintenance, the fact that there is a strong partnership increases the likelihood that this problem will be solved in the future. While in some cases, defaulters are disconnected to force them to pay their arrears, others who are trusted are sometimes treated more leniently.

The plan is to transfer the management of the scheme to the community or local authority. In this case, the balance will be disturbed and, unless capacity is built in the community itself, the long term sustainability is at risk, since the expertise from the private sector that has strongly influenced the success of the scheme could potentially be lost.

Box 4: Public-private partnerships

Case Study Experience: A good balance of public and private involvement maximises livelihood benefits to a wider community base

As mentioned above, the electrification scheme in Yaye is based on a strong partnership of public and private stakeholders, and it would seem that this has been a key to its success in delivering significant livelihood benefits.

Because electricity is available 24 hours per day, uses of electricity extend beyond lighting and entertainment. In addition to the ability to extend opening hours and provide better entertainment in shops and bars, new businesses have also begun to emerge as a result of the electricity supply. These include wood and metal workshops, grain milling services, automotive garages and photographic shops.

In the institutional sector, considerable benefits are also being realised. The local health centre can now provide a 24 hour service, whilst the local school has also begun to offer evening classes, improving access to education for those who need to work during the day. The library has also extended its opening hours, and the local government and religious institutions have now begun to introduce computers.

As a result of the wide range of uses of electricity in the community, all of the households that do not have a private connection are still benefiting from improved local services in a significant way. For example, children can now use the local school rather than opting to travel long distances to neighbouring schools with better facilities. This has a positive gender outcome, since it was only boys that would be able to travel to the better schools.

Box 5: Maximising benefits

economy' since it can lead to termination of contracts by consumers, loss of reputation for providers and negative attitudes to private sector involvement in electrification projects.

Public-private partnerships are one way of raising sufficient resources for a better scheme with increased access that maximises the livelihood benefits of a community.

LIVELIHOOD IMPACTS

Even though off-grid electrification schemes in Ethiopia are characterised by poor planning which do not consider pro-poor and wide access considerations, and low level of public private partnerships, there still is a positive livelihood impact as a result of both direct and indirect access to electricity in the domestic, commercial and institutional sectors.
When electricity is supplied 24 hours per day, this means that access to the benefits of electricity extend to a wider community base, through improvements in the domestic, commercial and institutional sectors.

Livelihood improvement opportunities are not always maximised. For example, although the school in Yaye is now offering evening classes, this service is not being provided by the schools in the other two case studies.

THE WAY FORWARD

OPPORTUNITIES, CHALLENGES AND CONSTRAINTS FOR COMMUNITY ELECTRICITY SCHEMES

Opportunities

The government is cognisant of the fact that the national utility alone cannot keep pace with and accelerate rural access to electricity through continuous grid extension or otherwise. This means that improving rural access to electricity through off-grid rural electrification calls for existing strategies to be revisited and the removal of barriers to accelerated off-grid rural electrification.

Limitations of the conventional approach and various barriers that have hampered the pace of rural electrification in the past have been recognised. Measures that are believed to facilitate entry of multiple players in to the market (industry) including the private sector, local governments, NGOs, community groups and civil societies, have been taken recently.

To this end, and in response to the challenges of improving access to electricity by rural areas, the government has been engaged in major policy reforms in the power sector including institutional restructuring and liberalization of the sector over the past several years. To this end, the government has adopted what could be termed as a technology-neutral, "Twin-track" Rural Electrification Strategy, which facilitates and provides for an increasing participation of the private sector in the supply of electricity to un-electrified rural towns, institutions, households and businesses.

Besides, the design of an institutional and financing framework for private sector-led rural electrification, which is expected to remove barriers and facilitate private sector participation in the provision of off-grid electricity supply (generation, transmission, distribution and marketing), has recently been completed and will commence soon.

Challenges and Constraints

Most rural towns are characterised by scattered settlements and low level electricity consumption, which makes it difficult to justify their access to high quality grid electricity. Data obtained from EEPCO shows that in 1999 there were over 300 towns from various regions awaiting electrification by EEPCO. It would not be economically feasible for EEPCO to electrify all these towns. This is a good indication for the potential market for off-grid power distributors with small and micro scale generation units of isolated systems. However, the market potential is associated with challenges and constraints that need to be addressed. These challenges and constraints include:

- Lack of Anchor Demand: An immediate and ready market for electricity in rural areas is mainly for lighting and entertainment. However, the demand is part-time, for only three to four hours during the night, and practically no load during day time. This is partly due to absence of sectoral co-ordination in community electrification planning. Such situations

will not entice the private sector investors as return on the investment will not be attractive enough.

- High Peak Demand: This requires high capital investment to meet the demand that prevails for a short period of time each day.
- Ability-to-pay: The communities' ability to pay should be assessed prior to setting a tariff or even before commencing the project. Affordability is not always the main reason for the lack of a connection for consumers. Charges should be commensurate with the quality of service provided.
- Willingness-to-pay: Comparing a local tariff with that of EEPCO's subsidised tariff on grid electricity is usually a problem associated with mini-grid power distribution systems. Even if grid electricity is not subsidized, naturally, delivered energy costs are much higher for small isolated systems for the simple fact that they are unable to benefit from scale economies. Light-handed regulation, transparency among service providers, and participation of the community during tariff setting helps to overcome some of the problems related to complaints to tariffs in off-grid systems. Customers are usually willing to pay even more for a reliable, extended and better quality electricity services.
- Ambiguous Electrification Master Plan: Problems can arise when the national grid is extended to the geographical domain of off-grid electrification schemes. Upon formalization of off-grid operations, institutional and legal protection needs to be put in place to protect small off-grid operators through harmonizing nation-wide electrification plans.
- Legal/Institutional obstacles: Most of such schemes operate de facto and are uncertain about their future. Therefore, cautious approaches need to be adopted when formalizing such operations through regulatory legislations so as to avoid possible hiccups in such processes during the transition period.

STEPS AND PROCEDURES FOR ESTABLISHING PRO-POOR COMMUNITY ELECTRIFICATION SCHEMES

Formal versus Informal Approaches to Off-grid/Community Electricity Schemes

Almost all off-grid rural electrifications in Ethiopia have so far been carried out informally without having proper planning which did not assess the present and future potential market and needs of the community. At times, some instances of electrification happens where communities would be surprised with unplanned donations of generating sets by NGOs or surpluses from oversized gensets that power institutions like rural health centres. Informal off-grid electrification schemes are highly susceptible to frequent outages and are generally unsustainable.

Even though the informal schemes are characterised by highly improvised systems with poor management, they have played important roles in providing the rural community some access to electricity. Through time they have developed some characteristics which enable them operate in the absence of legislation and any outside support.

Formal off-grid electrification is a new phenomenon in Ethiopia. It has been put in place with the intention of a strategic approach which helps realise development through coordinated efforts of the various sectors. While the rules, law and standards placed are necessary, due emphasis must be given in their implementation so that their enforcement will not have negative repercussions such as stringent and heavy-handed regulatory framework, which might hamper the pace of rural electrification.

Formalizing off-grid electrification may have a retarding effect on the existing and newly created rural electrification momentum, if law enforcement is not handled carefully and the regulatory framework is flexible, far-sighted and light-handed.

Formal approaches with enforcement of laws and provision of necessary incentives will help off-grid/ rural electrification schemes respond to consumer needs and ensure wider social.

(For SWOT analysis on Formal versus Informal approaches to Off-grid Electrification see Annex B).

Existing Steps and Procedures for Off-Grid Electrifications

The existing process of establishing formal off-grid electricity schemes is cumbersome. For any system to be licensed it needs to present feasibility studies, final scheme design, evidence of secured finance and all required permits depending on the type of system to be established. Without considering efforts required to prepare and obtain the above mentioned requirements, the licensing process at EEA will take 180 days through 26 steps.

As it stands now establishment of off-grid scheme needs to pass through the following steps:

Project Identification (Inception)

Projects can be identified by communities, NGOs, REF, local governments or private developers. Feasibility studies would be carried out on projects which do not fall in EEPCO's electrification master plan. Projects that come out to be feasible would be considered as pipeline projects for development.

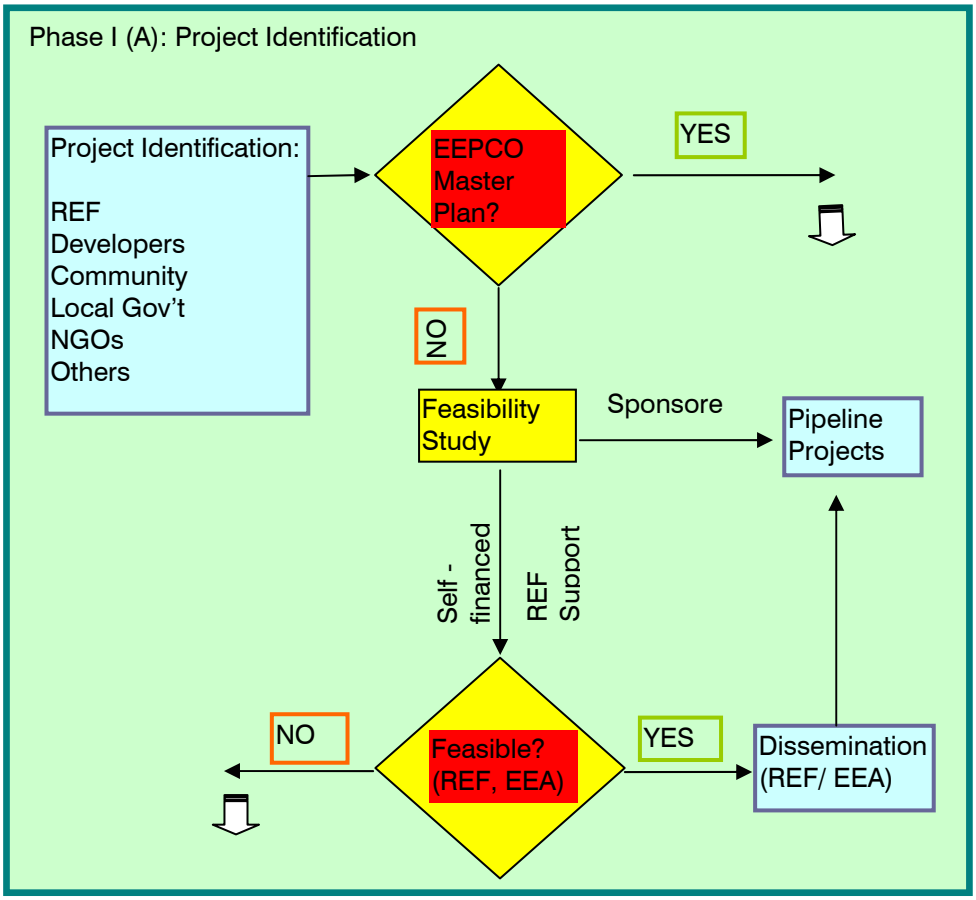

Figure 5: Project Identification process flow chart:

Legal Business Entity Formation

Pipeline projects require Project Champion Entities (PCE) to take the ownership and responsibility of identified projects for development. These PCEs can be Limited Liability Companies, associations, cooperatives, etc. Entity formation for electricity development does not need to follow a special process. It should follow the existing process depending on the type of PCE to be formed.

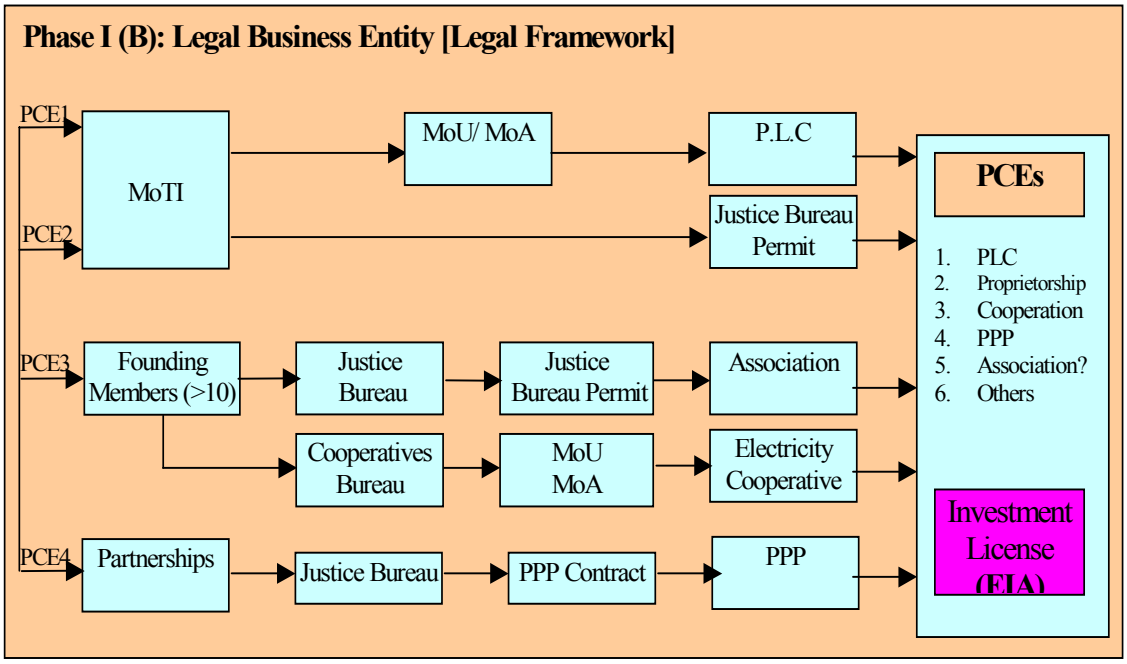

Figure 6: Illustration of various types of Project Champion Entity (PCE) formation processes

Obtaining Permits

- Land use permit: Regional Environmental Authority and Land Use bureaus are in charge of providing land use permits after consultation with officials at local and Woreda level.
- Water use right permit: Regional Water Resource Development Bureaus are delegated by the Ministry of Water Resource Development to deal with issuance of water use right permits
- Environmental Impact Assessment (EIA) approval: Regional Environmental Authority and Land Use bureaus are in charge of to provide approvals of EIA.

Licensing process

After finalising feasibility studies, final scheme design, evidence of secured finance and all required permits the developer can apply for issuance of the final electricity operation license at EEA. The licensing process in EEA according to the existing laws would take 180 days through 26 steps.

Key Stages of Electrification and Pro-poor Considerations

Project design/ Consultation/ Initiation

Tasks	*Partners*	*Pro-poor considerations*	*NEEDS*
Problem identification (present and future need assessment *Coordination: Multi-sector approach* *Community mobilization* *Maximizing the potential use of electricity for livelihood benefits*	*NGOs,* *local development associations,* *Community,* *Local government,* *Private sector*	*Sector institutions should be encouraged to maximize service provision through the potential of an electricity supply, for example by holding evening classes in schools to widen access to education, provision of better health services for longer hours, etc.* *Opportunities for new income generation activities need to be researched, and skills and training needs assessed.*	*A coordinated effort for making electrification projects financially feasible so that projects become attractive and bankable.* *Awareness-raising needs to be carried out to promote the benefits of income generation for local development.* *Information and promotion of new appliances should be available to ensure that people are aware of the costs and benefits of new appliances, and can make informed choices.*

Planning

Tasks	*Partners*	*Pro-poor considerations*	*NEEDS*
Feasibility	*External consultant* *NGO*	*Before a local electrification scheme goes ahead, the partners should facilitate a planning process that includes:* *Research into local priorities of needs* *Stakeholder participation* *Assessment of existing and future electricity requirements* *Identification of potential electrification options* *Selection of scheme based on whole communities' needs and interests.* *Preliminary scoping of technical and financial implications of providing an electrification system that could provide the required amount of electricity for those services.* *Assessment of communities' willingness and ability to pay.*	*Guidance on various participatory techniques.* *Tools for assessment of electricity demand associated with services.* *Guidance on how to undertake socio-economic analysis.*

Finance

Tasks	*Partners*	*Pro-poor considerations*	*NEEDS*
System design	*Where feasible, external technical design assistance should be obtained - private sector.*	*Common standards for electrification systems should be developed as a guide to system design.*	*Information on design aspects should be available through an obvious source, for example the national electricity authority.*
Capital raising	*Donors, banks, micro finance institutions, private sector, community*	*Donors and other institutions should specify pro-poor measures when providing funding for electrification.* *A proper planning process should ensure that private finance responds to the needs of the community as a whole, rather than being opportunistic.* *Communities can be very effective at raising capital.* *Business plans that do not cover future maintenance costs can lead to the financial failure of a scheme.*	*Communities require information and guidance on how to utilize their funds wisely for electricity provision, and how to access additional finance* *Guidelines need to be developed with advice for business planning and a range of possible financial models that ensure the financial sustainability of a scheme.*

Tariff-setting

Tasks	*Partners*	*Pro-poor considerations*	*NEEDS*
Tariff preparation	*Private sector, community*	*Assessment of communities' willingness and ability to pay* *Transparency in tariff setting and adjustment avoids mistrust*	*A socio-economic study should be undertaken to assess factors such as local income levels and ability and willingness to pay.* *Guidelines for tariff preparation need to be prepared that offer a range of models appropriate for different system types.*
Managing the scheme in a sustainable manner	*Private sector, community, municipalities, etc*	*Communities can successfully manage small electrification schemes through a committee of community representatives, but require support in establishing a transparent management system.* *Local authorities have the institutional capacity to adopt many of the management procedures that are required for electrification schemes, but these should be distinct from other municipal management systems.* *The private sector can provide efficient management that can lead to a profitable system. However, this is only likely to be accepted by the community if a high level of service is maintained.*	*Support should be available to communities and local authorities in how to run an effective and transparent management system.* *Guidelines for developing a management system need to be developed.*

Operation and Maintenance

Tasks	*Partners*	*Pro-poor considerations*	*NEEDS*
Operate the system daily. Carry out regular and major maintenances as required	*Community/ private sector/ municipalities*	*The party responsible for O&M should carry out regular checks on the system and distribution network.*	*Awareness of the risks and benefits associated with a well-maintained system. Technical training is required to ensure that systems are well-maintained and problems identified before they escalate and incur additional expenditures.*

OVERCOMING REMAINING BARRIERS TO ACCELERATED OFF-GRID COMMUNITY ELECTRICITY

Barriers to accelerated rural off-grid electrifications other than those generated from the very nature and characteristic of rural settings and associated electricity market problems include lack of dedicated and visionary developers, lack appropriate planner, inadequate technical skill and experience, lack of flexible and innovative financing mechanism and a lengthy and unclear legal licensing requirements and procedure.

Lack of Adequate Regulatory Framework and Enabling Environment

Apart from very few donor driven micro hydroelectric schemes, almost all off-grid rural electrifications are diesel systems. The high initial capital investment and a slow return on equity make the investment in village hydro schemes unattractive for a private developer unless some sort of incentive mechanism is introduced.

Usually, private operators install diesel gen-sets primarily for their own-consumption and sell surplus electricity to the neighbourhood. There are also significant numbers of rural towns that are electrified by privately owned schemes which are initiated for making profit from sells of electricity. The primary objective of all such schemes is to maximise profit even at the expense of reliability and service quality. Private operators need to be educated and regulated properly so that consumers are protected through ensuring provision of reliable and quality services.

Lack of Awareness among Communities and Consumers

There is a tendency among communities to consider charges of electricity services from off-grid systems to be very high. In actual fact however, people tend to spend more in retailed purchases of kerosene and dry cells which are seemingly cheaper alternatives. Communities need to be aware of their energy expenditure patterns and the potential benefits of electricity.

Inadequate Planning and Coordination

Planning includes assessment of present and future market potential from the very beginning of an electrification project, community mobilisation as potential source of finance, encouraging cross sector co-ordination in the community to maximise the potential of an electricity supply scheme (increased anchor demand), ensuring that resources are utilized to the best interest of the community, provide information and guidance on legal and administrative issues. The planner should prepare business plans assessing possible risks together with mitigation measures. When such detailed planning preparatory activities are completed successfully, the project becomes more feasible, bankable and hence more attractive to a developer.

Inadequate Technical Skills and Experience

For diesel-powered system there are capable engineering companies that can carry out electromechanical work and mini-grid installations and maintenances. Regarding electrification using renewable technologies (apart from PV systems), the local technical skill and experience is very limited. To date no single wind turbine is in use for electrification purpose in the country apart from very few small Rutland turbines installed in some organisations for demo purpose.

Lack of technical skills in the field of micro-hydro is one of the factors for limited instances of such electricity schemes in the country. Quite a few private companies, NGOs and government organizations showed interest to get involved in the development of micro hydro electrification schemes either as installers, equipment manufactures or civil contractors. Very few of such groups are involved in and in fact commissioned a number of micro-hydro schemes for mechanical shaft power such as grain mills.

Stakeholders Disengagement and Lengthy Licensing Procedure/Requirements

Despite the efforts of the government and donors to improve rural access to electricity, the pace of rural electrification projects development has been very slow. This is mainly due to lack of engagement among the multiple players (public, private, donors, communities, government) in rural electrification.

Moreover, the lengthy and cumbersome process of obtaining permits and licenses has become a daunting task for potential project developers.

RECOMMENDATIONS

- Local authorities have key roles to play in local planning that is carried out in conjunction with the community.
- Projects planners that play a coordinating role either through existing local development associations or NGOs should be encouraged for a pro-poor and wider access to electricity which maximises livelihood benefits.
- Further monitoring and follow-ups with provision of technical assistance and support of equity financing will have a substantial impact in consolidating the synergy already formed through the stakeholder engagement process.
- Engagement meetings should be replicated in regions throughout the country.
- Donors supports should extend beyond knowledge and research to equity financing of community electrification schemes through public-private partnership for implementation of pilot projects that could be models for further replication in various parts of the country.
- Given the great potential of the private sector in the supply of electricity services in remote off-grid locations, more is required to build confidence, develop trust and revamp robust public-private partnerships in the development, management and operation of RE schemes.
- Strong enforcement of law for legalised off-grid electrification may have a daunting effect in the already established rural electrification momentum if it is much stronger than the supports and incentives that can be provided.

Annex A - PACE Project Case Studies

Case Study 1: Private Off-Grid Electrification, Bonna, Ethiopia

Background

Since its introduction in Ethiopia, electrification has always been a dream for the residents of the remote southern town of Bonna. Many of them earn their income from trading farm produce bought from farmers in the surrounding villages. The most populous of the Ethiopian towns studied under this project, Bonna, has always had little prospect of getting connected to the national electricity grid, just like the other remote towns. Available data (see table below) indicates that the town has more men than women, and most of them are petty traders.

Bonna town details

Total population	*10,004*
Number of Households	*3,120*
Electrified establishments	*180*
Men as percentage of total population	*53%*
Women as percentage of population	*47%*
Monthly income for most people	*500Birr ($58)*
Cost of electricity	*US$2.33 per bulb a month*

The Bonna community has displayed remarkable entrepreneurial skills, through afforestation and other community development programs. This has not only encouraged a sense of collective action among the people, but has also improved their ability to raise funds for the electrification program.

A fundraising drive in 1994 enabled the community to raise US$ 17,791 in only a few months, mostly from community contributions. Unfortunately however, the Bonna community lacked access to information on how to proceed with implementing the electrification project and nine years later, they still have their money deposited in the bank waiting for someone to lead them in making the electrification dream a reality.

Despite this, a short term solution has been found, and Bonna is currently receiving electricity from a 12kVA diesel genset owned by a local businessman who reached an agreement with the community two years ago to supply the town with electricity for five hours every day.

Financing

The electrification of Bonna town was wholly funded by a private businessman after reaching an agreement with the community on how he would go about supplying the much needed electricity. Apart from purchasing the genset, he was also responsible for establishing a distribution line and constructing a powerhouse. However, new customers are required to pay for house wiring, poles and the cables that run from the distribution line to their houses.

Key players in Bonna

Stakeholder	*Key actors*	*Role*
Owner of the genset	*The manager and operator of the genset*	*Financing and installation of the complete system*
Bonna town Council (or Kebele)	*The chairman and development committee members*	*Provided permission and facilitated the electrification process*
Community	*Residents of the town*	*Participated in tariff setting in the initial stage of the project*

Public-Private Partnerships

The process of electrifying Bonna town has had three main actors: the owner of the genset; Bonna Town Council and the community. The tariff was initially set in conjunction with the community at US$ 1.4 per bulb per month but, since then, the genset owner has raised it to US$ 2.33 per bulb per month.
Despite the involvement of both public and private sector actors, the electrification process has mainly been dominated by an unchecked private sector – leading to a very unsatisfactory situation for all parties. The electrification scheme is characterised by a poor standard of power supply, hazardous equipment and a lack of response to problems and complaints – all leading to a generally unsustainable situation.

Access to Electricity

Livelihood benefits – Direct Consumers

Although many household consumers felt that service delivery was poor and unreliable, mostly through frequent and unexplained power interruptions, they all agreed on the fact that it is better than using candles or kerosene wick lanterns in terms of quality of light, price and cleanliness. Due to high voltage losses and the fact that the capacity of the system is too small, users cannot utilise the power for anything other than lighting. Only those residing near the powerhouse are able to play radios or cassette players. Livelihood benefits have been felt across the genders in nearly all the connected households, with most people mentioning smoke-free lighting as the main benefit.

Figure 7: Community representatives meet in Bonna town

Domestic Benefits:

The light, though dim, provides enough power for the children to study and the parents to read books and socialise at night. Soot and smoke levels have also been reduced, improving hygiene in the home.

Both men and women mentioned that it is easier to entertain and to have family gatherings in the evenings. Their only regret is that electricity is only available five hours a day, and can be used for no more than just lighting bulbs. Connected households were also riled by the power interruptions, which occur on average eight times a month; moreover without any compensation for the days they have to go without power. There were also complaints about lack of prompt replies to complaints, and delays in restoring broken distribution lines.

Figure 8: Bonna Town Centre

Commercial and institutional users

Since electricity in Bonna town is just enough to power bulbs and nothing more, commercial users said they have not benefited that much from having electricity in the town. None of the commercial users who participated in this study were able to use the available power for radio and cassette players, which means they cannot provide their customers with any entertainment. Moreover, the voltage often drops along the transmission lines making it impossible to use the radio. Institutions like the health centre use electricity but only for indoor lighting. Only the municipality uses electricity for street lighting, and even then the security lights can only be found at the centre of the town which is close to the power house.

Livelihood benefits – Indirect Consumers

Even though the power provided is only used for lighting, 70% of the unconnected households said they have benefited from having electricity in Bonna town mainly because the shops, pharmacies and clinics remain open for longer hours. Interestingly, none of the unconnected households listed street lighting among the benefits, although they all agreed that local entertainment places are offering better services with better lights.

Conclusions

The experiences of the Bonna community stand in sharp contrast to the other electrified Ethiopian towns in this study. The town has not enjoyed the fruits of electrification even though they have US$17,791 in the bank ready for use. With this capital, the community has the potential to establish its own diesel power supply option. To increase the chances of success with any future venture, it is important to heed some key lessons that can equally be applied to communities elsewhere:

- Rural communities need better access to information on how to go about the electrification process.
- Public sector involvement is required to ensure the regulation of private-sector led initiatives.
- Even when tariffs are set in consultation with the community, this can still lead to dissatisfaction if the quality does not live up to the agreed tariff rate.
- If tariffs are adjusted without transparency, this can lead to mistrust.

Entrepreneurial aspirations may be wasted if communities can do little more with the electricity than light their bulbs.

Case Study 2: Municipality Owned Off-Grid Electrification, Bonosha, Ethiopia

Background

Bonosha is a relatively small town in southern Ethiopia. Like Yaye town, people here survive on petty trade of agricultural products, although farmers too have a relatively strong presence. They supply the traders with farm produce, and in turn buy goods and services from the town traders. Details of the population in Bonosha town are summarised in the table below.

Number of Households in Bonosha town	*614*
Electrified Households in Bonosha town	*200*
Total population of the town	*2,885*
Number of males	*1,432*
Number of females	*1,453*
Monthly income for most households (74%)	*300 Birr ($35)*
Electricity tariff	*$1.16*

Table 3: Statistical details of Bonosha town

Bonosha was electrified in 1996 following the purchase of a 75kVA diesel generator from a neighbouring town which became connected to the national grid just before they installed it. The genset, which cost the town US$ 8,140, worked for only six years due to lack of sufficient funds for maintenance repairs. It had been installed by a high school electricity teacher whose only skills were making minor home system installations and repairing electronic equipment. Hiring an electrical engineer had proved too expensive.

In February 2002, Bonosha town was re-electrified from another genset that was acquired for a health centre built in 2001. The 115kVA genset that cost US$ 17,093 was too large to limit its use to the health centre, and so the town was also connected. The genset serves 300 customers excluding the health centre. At the same time, the Bonosha municipal council eventually got the first genset fixed at US$ 1,047, and by February 2003 were planning to begin running it again.

Financing

The first electrification phase was coordinated by an electricity committee that was formed during the 1990s to work out ways of electrifying the town. They mobilised the community in raising funds to buy a genset, and required each household to contribute according to their income standings with contributions varying between US$ 17 and US$ 52. The municipal council established a special tax which was levied during market days from every trader. The tax revenue was used to finance the electrification project. The second electrification phase was coordinated by the municipal council together with the Ethiopian Social Rehabilitation and Development Fund (ESRDF). The community contributed 20% of the costs incurred in building the health centre, although it is not clear whether they contributed to purchasing the genset.

Figure 9: Streetlighting and transmission lines in Bonosha

Public-Private Partnerships

Electrification of Bonosha town was mostly a community initiative, with the municipality council playing a leading role in mobilising funds. However, the presence and contribution of the ESRDF further boosted the town's electrification efforts, since the council was chronically short of funds. This partnership made all the difference in finally getting most of Bonosha town electrified.

Access to Electricity

The successful electrification of Bonosha has enabled many of the town residents to access electricity. However problems still exist owing largely to the poor design and quality of the system. Wooden poles and an inappropriately sized copper conductor of $4mm^2$ were used resulting in huge voltage losses along the distribution line. During the first electrification phase, power was initially made available for five hours a day, at US$ 0.70 per month for every 60 watt bulb. Later the tariff was increased to US$ 1.16 per bulb per month, thus excluding many residents from using electricity.

At least 70% of the households without electricity said they cannot afford it. But many connected households were also consuming more electricity than they were paying for since charges were only levied for just the bulbs and not the radios, cassette players and TV sets which consumers freely used.

Electricity thefts are rampant in Bonosha, prompting the municipal council to hire someone to catch the thieves. The fact that some people use radios and televisions means that clients that do not live near the electricity source can only obtain a very low voltage of supply. The system was installed for lighting purposes but no monitoring is taking place to ensure that this is the case. Complaints are rife regarding low voltage electricity, with some clients receiving just 96V (as opposed to 220V).

Livelihood benefits – Direct Consumers

Those households that are receiving an electricity supply are mostly happy about the huge savings they are making after abandoning the kerosene lanterns. At least 30% of connected households said that their monthly fuel expenses had gone down. Those with radios and TV sets now have easy access to information and entertainment (albeit illegally). Residents also reported an improvement in the health aspects of their livelihoods, with less eye and respiratory problems. Both men and women are also pleased with the fact that students are able to study during the night. This has also had the effect of improving the status of the local school.

Figure 10: Potential micro hydro site on Wara Falls near Bonosha

Domestic Benefits

Irritation of the eyes and respiration difficulties from smoky kerosene wick lamps were common problems, but that is now in the past. 58% of men and 63% of women mentioned this as the main benefit.

Commercial and institutional users

All the commercial users said their expenses on lighting reduced markedly after switching from the pressurised kerosene lanterns to bulbs. They are also able to use radio cassettes and televisions to attract customers from both Bonosha and surrounding areas. So far, the potential benefits of the scheme are not being fully realised for the institutional sector, since electricity is closed. The local health centre is the main institutional only supplied after 6.30pm, when most institutions are consumer, using electricity for refrigeration of vaccines. Despite the erratic power supply, Bonosha town is now a much improved image from eight years ago.

Commercial Benefits:

It became evident to most commercial users that the introduction of electricity to their town attracts customers even from the nearby towns.

Livelihood benefits – Indirect Consumers

Thankfully, benefits have not been limited to those who are directly accessing electricity, since only 30% of households are connected. Investigations in Bonosha revealed that availability of power has brought benefits to all town dwellers and to the farmers who live in the surrounding areas. At least 90% of households not connected to the grid said they had noticed improvements in service provision by both the government and local institutions. Moreover, street lighting has helped improve security in the town, shops are open till late in the night, they have a pharmacy, and they can watch television while relaxing in the bars or restaurants.

Prospective Benefit: When asked what they would do with better electricity provision, over 50% of households and business establishments responded that they would invest in income generation activities such as provision of grain milling services and better entertainment facilities.

Conclusions

Bonosha town did well in persisting with the electrification process, and succeeding against all odds. However the following issues arise:

- Existing revenues cover running costs only, endangering the sustainability of the scheme and holding little prospect for improving affordability.
- Unless stopped, power stealing is likely to erode any opportunities for generating sufficient revenue from the system.
- Without tariff reductions, many households are likely to be excluded from the direct benefits of electricity in their household.
- To increase access for the whole community under current conditions, efforts should focus upon improving commercial uses of electricity (eg employment opportunities relating to income generation activities), especially since community members are keen in this area
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Case Study 3: Community Owned Off-Grid Micro-Hydro Scheme, Yaye, Ethiopia

Background

A rural town in Southern Ethiopia with a 4,555-strong population, Yaye is a trading community mostly dealing in agricultural products. About 34% of the population are middle income earners, while 8% of are high income earners. Yaye got a 170kW micro-hydro power plant in 2002, after two previous failed attempts to electrify the town using diesel gensets in 1987 and 1994, at a total cost of US$ 697,674.

The community played a pivotal role in the construction of the micro-hydro plant, including clearing and preparing the plant site, building an access road, diverting the river flow, digging the canal, and provision of poles for the mini-grid.

The local council members were directly in charge of the project. They co-ordinated and mobilised the community for the various tasks, while the Sidama Development Corporation (SDC) and the Sidama Development Program (SDP) provided technical assistance. They have helped access information and equipment, facilitated machinery procurement, prepared the tender for selecting a local company to do the installations, and are generally managing the scheme.

Number of Households in Yaye town	*940*
Electrified Households in Yaye town	*320*
Total population of the town	*4,555*
Number of males	*2,207*
Number of females	*2,348*
Monthly income for most households (58%)	*500Birr ($58)*
Electricity tariff	*US$ 0.0494 per kWh*

Table 4: Statistical details of Yaye town

Financing

Yaye is situated hundreds of miles from the nearest national electricity grid location, and connecting it would require at least US$1.4 million. This was too high a cost for the national utility company, Ethiopian Electric Power Corporation (EEPCO), meaning that grid extension would be an unfeasible option for the Yaye community.

Therefore, the community teamed up with the local council leaders and collected funds for the purchase of a turbine and a generator which were unfortunately stolen during transit in 1998. It took the community another two years to replace them, and this was only made possible with a grant from Irish Aid through SDP. The micro-hydro power plant now provides consumers with electricity 24 hours a day.

Public-Private Partnerships

The eventual successful electrification of Yaye town would clearly never have happened had it not been for the strong working relationship between the public and private sectors.

SDP, a local non-governmental organisation whose formation was initiated by government helped the community to secure a loan for purchasing and installing a turbine and a generator. These were installed by a local private company called Sigma, the first such job they had ever done. The project is currently administered and managed by SDC through seven staff; an administrator, a finance head, technicians, guards, a cashier, and a meter reader.

The local council also played a major role in mobilizing the community to participate in bringing electricity to Yaye. Though the community's contribution was not considered when costing the project, it was central to the successful completion of the project. Building roads, providing poles, clearing the site, diverting the river flow, they did everything.

Category	Consumption (kWh)	Rate (US$/month)
Households	1-25	0.29
	26-50	0.47
	51-100	0.76
	101-200	1.05
	Above 200	1.28
Commercial	Petty trade	0.99
	Big trade	1.45
Industrial	Constant	4.83

Table 5: Yaye MHPP service charges

Access to Electricity

Some of the factors that determined access to electricity in Yaye town include affordability and proximity to the power source. At least 30 customers get disconnected each month due to non-payment of their electricity bills, although most of them get reconnected in no time at all.

Figure 11: Micro-hydro site in Yaye

At present 320 households, 62 commercial establishments and 5 industries are using the electricity. The total monthly revenue from electricity consumption should be at least US$1,047 but only US$814 is collected. This is because some consumers sometimes just can't pay. Defaulters are often disconnected to force them to pay their arrears, although some trusted ones are sometimes treated more leniently.

Meter sharing among households and commercial establishments is quite common probably because it is expensive to purchase one and this could be the reason peak hour demand is only 50% of the system capacity. Perhaps because the community was involved in setting the tariff, there are no complaints from consumers in that direction.

Livelihood benefits – Direct Consumers

For the 320 households with electricity, life has certainly improved. Apart from doing away with the dreaded blackness of the night, electricity has opened up new sources of information (for those who are able to buy a radio and a television).

Domestic Benefits

After connecting to the new electricity supply scheme, an overwhelming majority of the households studied have noticed significant reduction of costs related to expenditure on lighting.

Available statistics show that 10% of the households with electricity use it for cooking, 5% for refrigeration, 40% for entertainment, and 100% for lighting. Some households also use electricity for baking bread and making stands for electric stoves.

Commercial and institutional users

Commercial users have benefited immensely from the 24-hour availability of electricity, far more than the domestic users. All types of businesses have been established including metal workshops, grain milling services, automotive garages and photo-shops.

Electricity has brought the town to life, and now professionals especially teachers and doctors are seeking employment in the town. The headmaster of the town's major secondary school said it was always impossible to attract well qualified and experienced school teachers. But at the time of the interview, four experienced teachers with very high qualifications had applied to his school for jobs. The situation is the same at the local health clinic, where the quality and quantity of staff have significantly improved.

Commercial Benefits: New, improved and extended services have been improved by businesses and commercial establishments resulting in increased incomes and creating new job opportunities.

Figure 12: Productive uses of electricity in Yaye – a wood workshop and one of its products

Livelihood benefits – Indirect Consumers

Even households without access to electricity admitted to a major improvement in their lives. Although they have no power at home, they enjoy better services at the clinics, schools and restaurants. The school library now stays open until 10.00pm, while the clinic now operates 24 hours a day. Service delivery by government departments has also improved after they computerised their operations.

Conclusions

While the micro-hydropower plant in Yaye town has had a profound effect on the community, the following points must be taken into account:

- Efforts should be made to ensure the project remains profitable after SDC hands it over to the community.
- Close cooperation between the managers and the consumers has been crucial to the project's success, especially in setting tariffs.
- 24-hour electricity means that electricity can be used for much more than lighting and entertainment, including productive uses that help to boost the local economy.
- Because electricity is being used for a wide range of uses in the community, households that do not have a private connection are still benefiting from improved local services in a significant way.
-

Annex B: SWOT Analysis for Formal and Informal Approaches to Rural/ Off-grid Electrification

Gauging Parameters	*Informal*	*Formal*
Strength	*Less bureaucracy and immediate implementation of scheme* *Fast rural electrification though services can be poor*	*Proper planning and market study* *Standardised system design* *Proper and reliable service provision* *Good business plan* *Potential for wider access to electricity* *Good operation and management*
Weakness	*No proper planning and market assessment* *Poor system design and low quality material seemingly cost effective but lead to low quality service and ultimate failure of system* *Inappropriate tariff* *Unreliable service* *No proper business plan leading to financial unsustainability of the scheme* *Usually associated with poor management* *Limited source of finance*	*Long process of obtaining permits and licence* *Could halt accelerated rural electrification through off-grid system without technical and financial support*
Opportunities	*No access to REF*	*Access to REF* *Access to finance institutions (Banks, donors, etc)* *Legal protection*
Threats	*No legal protection:* *Displacement by grid expansion* *Pilferers and payment defaulters* *Interference of local officials* *Facilities can be precarious (land, property, etc.)*	*Revocation of license on failure to meet the required standard* *Risks associated with relatively larger investment if potential market for electricity fails.*

Part III: NEPAL

By

SBB Ltd

Contents: Part III Nepal

INTRODUCTION

Exploring ways of improving access to electricity is essential for poverty reduction. The emergence of service delivery through public-private partnerships meets growing concern that only the wealthiest members of communities will benefit from expanded electricity services. The main objective of the PACE project[11] has been to review existing public-private partnerships in small-scale electrification projects in four countries, and develop an understanding of what is required to ensure that community-based electrification is both sustainable and able to deliver livelihood benefits to all social sectors.

Focusing on Nepal, this document is one of four sets of National Guidelines that represent the key outputs of the PACE project. The other guidelines are for Ethiopia, Sri Lanka and Uganda and the lessons from all four countries have been compiled into an International Guide, which is aimed at international stakeholders actively involved in community electrification and poverty reduction programmes or projects.

Within the context of electricity sector reform, and existing electrification programmes, this document has been designed to highlight the key issues that are emerging for community electrification processes in Nepal, based on recent experience. The recommendations apply to public and private actors at the national, local and community level.

In summary, the guide covers:

- The status of electricity sector reform and implications for poverty reduction
- Overview of current rural electrification activities
- Recent Lessons
- New initiatives
- Challenges ahead

STATUS OF ELECTRIFICATION AND ELECTRICITY SECTOR REFORM

The Nepal Electricity Authority (NEA), a government-owned utility company, is currently responsible for most of the generation, transmission and distribution of electricity in Nepal. Since the electricity sector was reorganised with the formation of the NEA in 1985 the percentage of the population with access to electricity has increased from 6% to 20%. This figure is set to rise to around 25% in the next few years with the completion of on going rural electrification projects. However, given the nature of the terrain in Nepal and reluctance to invest in further electrification due to its low returns it will be a while until the majority of Nepalis have access to electricity. While off grid options will cater to some of the population most will need to be served by the grid.

It is envisioned that the NEA will eventually be divided into separate entities for generation, transmission and distribution, with an increasing role for the private sector. The private sector already has a significant involvement in electricity generation with a quarter of the hydro capacity of the country. This proportion is expected to rise as more power plants are built by the private sector. Distribution is largely with NEA and regulations have been put in place for distribution to be taken up by the private sector.

A fully fledged regulator is yet to be put in place even though the Electricity Act has provision for it. As the role of the private sector increases, especially in distribution, the need for a regulator will become more apparent which should stimulate the establishment of a regulator. The regulator will be

[11] The PACE project has been funded by the UK Department for International Development (DfID)

responsible mainly for grid electricity. Off-grid energy sector has more flexibility especially regarding tariffs which are not be regulated.

It is estimated that only 4% of the rural population has access to electricity. An ADB funded electrification project is expected to raise the rural access to ten percent in the next few years with an expected impact on livelihoods mirroring other successful rural electrification projects to date.

Off grid electrification is largely done by Solar PV and micro-hydro. They both receive subsidy for areas where the grid is not planned to be extended in the next five years. Subsidy on PV is being phased out while the subsidy on micro-hydro will be continued.

Population	*23.1 million*
Physical Area	*147,181 sq km*
GNP Per Capita	*US$ 210*
Urban/Rural Population Mix	*15/85*
Percentage Electrification of Households	*20*
Power Generation Installed Capacity	*600MW*
Literacy Rate	*53.7*
Life Expectancy	*59.7*

Table 6: Nepal Country Statistics

Nepal is one of the poorest countries in the world with a low HDI index of 0.49. In spite of this electricity is at the top of the priority list for most rural Nepalis. Road and electricity are the two main priorities for development and more often than not electricity has the higher priority. This is partly because electricity is considered to be more achievable than road projects but also because of the realisation that without electricity, development is impossible. While the government realises the potential of electricity and the public demand and political pressure for access it is hampered by its limited resources.

The government has followed a two pronged strategy of extending the grid and also PV and micro-hydro for the more remote areas where the grid extension will not take place reasonably soon.

ACCESS TO ELECTRICITY

Even though electricity was first generated in Nepal in 1911 it wasn't until the mid seventies that there was a sizeable power sector in Nepal.

	1911	*1975*	*1980*	*1985*	*1990*	*1995*	*2000*	*2003*
Percentage population served	*NA*	*NA*	*NA*	*NA*	*8.5*	*12*	*15*	*20*
Energy consumed, GWh	*1.5 estimate*	*110*	*168*	*345*	*550*	*787*	*1174*	*1522*

Table 7: Growth of electricity consumption in Nepal

With the completion of electrification projects which are being carried out now, the total population with access to electricity will be around 25%. Since around 85% of the population is considered to live in rural areas this indicates that all urban areas and parts of their suburbs have been electrified. All that remains to be electrified are the rural areas.

The average consumer consumption is 1600kWh per year. The average for domestic consumers is 660kWh per year and for industrial consumers the average is 32000kWh. The revenue and consumption of industrial and domestic consumers are about the same and account for 80% of the total energy sales and consumption.

PUBLIC-PRIVATE PARTNERSHIPS AND ELECTRIFICATION

The history of electrification is a chequered one with both the private and public sector playing key roles at different times. The initial generation was from the public sector. As industrial towns grew, the private sector took the initiative to provide electricity, both for itself and the surrounding population. With the development of micro-hydro power based electrification the private sector's role increased. The Electricity Act of 1992 laid the legal foundations for private sector involvement in electrification.

Over the last 30 years, the development of the hydro industry has been a significant private sector development for electrification. The capability to implement hydro projects using Nepali skills and locally manufactured equipment is a major factor in the micro-hydro based electrification policies of the government.

A brief summary of the major developments in electrification in Nepal is given in Table 8.

1911	*First hydroelectric plant installed in Nepal- capacity 500kW.*
1936	*Second hydroelectric plant installed- capacity 640kW*
1943	*Morang Hydroelectricity Company, the first private hydro company in Nepal starts generating power.*
1969	*The Nepal Electricity Corporation is established as the government entity responsible for supplying power in Nepal.*
1970s	*The micro-hydro industry makes its first steps. Micro-hydro based milling begins to increase in popularity. The government makes a policy decision to electrify all 75 district administrative centres. This was mainly by hydropower with solar in a few cases*
1980s	*Subsidy for micro-hydro based electrification made available.*
1985	*Nepal Electricity Authority established. This Act "bundled" the power sector.*
1992	*Electricity Act enacted. This Act lays the basis for private sector involvement in the power sector.*
2001	*Government passes the Hydropower Development Policy 2058 which revised and updated the Hydropower Development Policy 2049 for licensing hydropower projects, and for selling electricity to consumers in and outside Nepal*
2003	*Community Electricity Distribution by-laws come into effect. A new initiative which permits private sector and community organisations to purchase power in bulk and sell to individual customers.*
Current status	*Today there are over 2000 micro-hydro and more than 25,000 PV SHS in Nepal. 20 % of the population has access to electricity*

Table 8: Chronology of Electrification in Nepal

Hydropower development has made great strides in the last 15 years. A comparison of the situation between 1990 and 2003 is given below to illustrate.

	1990	*2003*	*Growth*
Installed power, MW	*255*	*609*	*2.4*
Energy consumed, GWh	*695*	*1522*	*2.2*
Domestic customers	*275,000*	*850,000*	*3.1*
Industrial customers	*7,500*	*18,800*	*2.5*
Total customers	*290,000*	*885,000*	*3.1*
Peak demand, MW	*176*	*470*	*2.7*
Percentage population served	*8.5*	*20*	*2.4*

Table 9: Comparison of the Power Sector between 1990 and 2003

The power sector has doubled in a decade. At this rate of growth we can expect that in the next 20 years the coverage will increase significantly.

Up to now electricity generation and distribution has been almost entirely done in the public sector and the public sector still accounts for the major bulk of the electricity business in the country. However, in the initial stages of development the private sector did take the initiative, especially in supplying power to industrial cities like Biratnagar where the jute and sugar mills and other industries required power. These were later amalgamated into the National power system. The situation has now come full circle with the private sector once again taking an active role in the power sector.

RECENT LESSONS

Within the PACE project it has been possible to analyse the impacts of recent examples of community electrification through public-private partnerships and also to explore opportunities to maximise access and livelihoods impacts in Nepal. Detailed case studies[12] were carried out in two projects, one which is a community built and run project and the other a government built system leased out to the private company:

Case Study 1: A small hydro scheme in Tehrathum with a capacity of 100kW, built by the government of Nepal to provide its administrative centres with electricity.

Case Study 2: A 50kW micro-hydro plant in Ghandruk, built in 1992 through a public-private partnership between the local community and a non-governmental organisational, Annapuma Area Conservation Project (ACAP).

The case studies focused on:

- Project implementation processes: Initiation, finance, structure, levels of stakeholder involvement, tariff arrangements, management, maintenance and general sustainability.
- Livelihood impacts: Analysis of both direct and indirect access to electricity in the domestic, commercial and institutional sectors.

The case studies reveal the way in which the various actors have worked together to achieve these projects, and offer valuable lessons for other communities and electrification stakeholders. Most importantly, however, there are important recommendations for national level policymakers.

[12] See Annex A

PROJECT IMPLEMENTATION

Community based electrification schemes, especially micro-hydro, require strong institutional support in order to succeed (see Box 1). Local community organizations generally lack capacity to deal with the legal, technical, and administrative aspects of electrification such as project design, installation and maintenance of equipment, and sourcing of funds. It is necessary to have in place Institutions that can give direction to community efforts in accessing essential services especially during the early stages of establishing an electrification scheme.

Strong institutional support made all the difference during community efforts to get electricity in Ghandruk village

Electrification of Ghandruk village in Nepal was spearheaded by a non-governmental organization, Annapuma Area Conservation Project (ACAP) which joined hands with local leaders in 1990 to mobilize financial resources for the construction of a 50KW hydropower plant. Apart from improving quality of life, the project was expected to boost ACAP's efforts to combine tourism with sustainable resource management through reducing fuelwood consumption by tourism businesses. The organization gave the community a loan for the project, and also provided training in the design and management of electricity projects. In general, ACAP provided technical, financial and administrative assistance for the project, and also contracted a resident engineer for two years to assist the project in utilizing electricity for cooking.

Box 6: The role of institutional support

It is important to ensure that everyone with a stake in the electrification project is involved right from the outset. The "access to all" policy ensures that even the poor have access to electricity, and reduces the possibility of future conflict between consumers and service providers.

Adequate planning and preparation must be made during project design to deal with long term increases in demand for power so as to ensure sustainability of electricity supply to existing and new consumers.

Limited power supply in Ghandruk affected the overall success of the village electrification project

After getting electricity to their homes, consumers in Ghandruk village acquired various electrical appliances including radios, televisions and refrigerators. It soon became apparent that the community needed more electricity than was available. Consumers who had initially subscribed for small amounts of electricity strongly complained about their failure to get more electricity to their houses. By the time they realized that they would need more electricity, it was not possible to increase their supply because the plant was already operating at full capacity and could not generate more electricity. New consumers could not be connected. This reduced the electrification benefits for both the service provider and the consumers, and it meant that more funds would have to be sourced in order to expand the capacity of the hydropower plant. This situation would have been avoided if prior research had been carried out during the project planning stage and provisions made for the long term demand increase.

Box 7: Limiting factors to success

Lease agreements, or other agreements, with the private sector should be carefully negotiated in order to avoid future conflicts and a decline in the quality of service to the consumers. If the organization that owns the electricity plant is separate from the operator, then the responsibilities of each must be

clearly defined. This helps prevent future disputes and a possible disruption of power supply to consumers.

Private sector management of a public sector utility can greatly boost the organization's performance and the quality of its services to consumers (see Box 8). This is evidenced by the significant improvement in the operation and management of those hydropower plants that government leased to private sector operators.

Private sector participation boosted the performance of the small hydropower plant in Tehrathum

Ten years after building a small hydropower in Tehrathum, the government of Nepal decided to lease the plant to a private sector company, Singha Bahini Bidyut (SBB) which assumed all responsibilities for carrying out maintenance and plant repairs. Despite occasional difficulties in their relationship the two have enjoyed mutual benefits from the co-operation. The Nepal Electricity Authority (NEA) now collects an income paid regularly by SBB, while more local people are employed in the management of the scheme. At the same time, quality of service to customers improved considerably.

Box 8: The role of private sector participation

Micro-hydro has very high evening peak load, as domestic users start to operate home lighting and appliances. Therefore load management, to spread the use of electricity over the day, preferably combined with income generating activities that use electricity, is an important aspect of sustainability in rural micro-hydro based electrification schemes.

LIVELIHOOD IMPACTS

Rural electrification is a necessary but not sufficient condition for increasing income generating activities (see Box 9). Income generation and poverty reduction take longer and are much slower than simply building an electricity system. Often electricity use initially focuses on improving livelihoods and quality of life. To achieve income generation a longer term strategy targeting skills acquisition and market access must be developed.

Tehrathum enjoyed huge benefits after the government built a micro-hydro power plant *but direct income generation was not among those benefits. Consumers said they were unable to start income generating activities due to lack of access to markets, poor technical and business management skills and inadequate capital. Although the number of industries in Tehrathum increased from four to ten, and government institutions acquired computers, fax machines and photocopiers, individual consumers were incapable of immediately starting business, and limited electricity use to light bulbs and powering radios.*

Box 9: Electrification in Tehrathum did not automatically result in increased income generation

A higher and more extensive level of public service is possible with electricity that would otherwise not be possible or very difficult without it. For example medical services are used more because of convenient 24-hour lighting and sterilizing facilities are available.

Access to electricity is closely linked to access to political power and empowerment. People who do not have access consider their political weakness to be an important factor in their lack of access to electricity. Electricity access has an impact on reducing political estrangement.

Livelihood impacts are enhanced when women benefit from electrification through increased access to health, water and education services. As the main custodians of the home, their contribution to the household can benefit other family members through improved nutrition and sanitation, better hygiene, and increased household income.

Lighting, TV/radio and security are the top three usage of electricity for household use in rural communities. Although both men and women benefit from this, women feel the positive livelihood impact more since this has a direct relation to their area of work. More women than men feel that electricity has had a positive impact on their livelihood.

Electrification improves livelihoods if it results in the introduction of services that have greater relevance to the poor such as grain milling and rice hulling which they would otherwise have undertaken manually. It saves a lot of their time, and gives them an opportunity to participate in the social, economic and political events of the community, and to explore opportunities for income generation.

More women than men report livelihoods improvements following the electrification of Tehrathum

More women than men in Tehrathum attributed the improvements in their livelihoods to electricity saying it had made life easier especially after the number of mills in the village rose to seven. More mills meant easier access and more time saved. At the same time women no longer spent long hours doing this work manually, and could afford to engage in other productive activities.

Box 10: Reporting livelihood improvements

Those without a connection to their homes also derive benefits from electricity. The convenience factor (noted by 95% of households) provided by facilities such as mills, telephone, fax, computers, street lighting are enjoyed by a larger population than just those that have electric connections. As mills are one of the first industries installed when electricity is available it is an important factor in reducing drudgery and saving time, especially for women. Without electricity these services would not be available, or only available at a higher cost, and is therefore seen as a benefit.

Extensive use of firewood for cooking will continue even after electrification because it is free and few households can afford to buy modern cooking appliances. Continued depletion of forest resources could therefore constrain livelihood impacts in electrified communities until households can afford to switch from traditional fuel use to the more modern energy sources, particularly kerosene, gas or electricity.

Extensive use of electricity for cooking happens only in circumstances where it is similar to the cost of other available fuel sources and a concerted effort is applied in order to promote its use for cooking.

Price of electricity is not a major issue with most consumers. Provided that the supply is continuous and reliable people are willing to pay a higher price than they are paying now. Since this willingness is higher among commercial and industrial users it indicates that there is a high degree of awareness of the employment and economic opportunities made available by electricity.

THE WAY FORWARD

OVERCOMING REMAINING BARRIERS TO ACCELERATED COMMUNITY ELECTRICITY

The main barriers to accelerated rural decentralised electrification include lack of finance and lack of the requisite technical and managerial skills of organisations who want to get into this sector. The ability of rural communities to utilise electricity for improving the quality of their lives also needs to be addressed. The following are some of the barriers to accelerated implementation of community electricity projects in Nepal:

Inadequate Technical Skills and Experience: While the number of companies with enough expertise to install micro-hydropower plants is increasing, there is still a significant lack of skilled people who are

able to efficiently operate and maintain micro-hydro plants in rural areas. This problem is likely to persist especially as the number of "community electricity" schemes grows mainly due to poor availability of training opportunities for rural people in technical skills, and unwillingness by qualified technicians to settle in rural areas.

Lack of finance: Despite the successes of community schemes in Nepal, there are as yet no structural mechanisms for financing "community electricity" in Nepal. The difficulty of securing funds for rural electrification is compounded by the high risk associated with investments in rural areas, mostly related to civil unrest, low purchasing power of potential consumers, higher transaction costs for financial institutions and a poor business environment. Although government plans to provide an 80% subsidy for electrification projects, in reality this is too high for government to maintain and it will most likely have to be reduced. Project developers would therefore have to find alternative means for financing the non-grant part of the investment costs. The best strategy would be to provide commercial banks with strong proof of the long term financial sustainability of rural electrification projects. Since commercial bank involvement is integral to private sector participation in community electricity projects, it would be fair to conclude that the involvement of commercial banks is not only a requirement but a major test of the success and sustainability of public private partnerships.

Improving livelihoods: Increased utilization of electricity in rural areas especially for income generation would improve the financial viability of electrification schemes, and it would encourage commercial lenders to get involved in rural electrification. Government or other agencies must assist local people in starting businesses in trade and food processing, and in accessing national and regional markets by building better roads and telecommunications.

The low financial sustainability of community electricity projects: Severe poverty in rural areas remains a major constraint to rural electrification in Nepal. As a result, the country faces a "poverty trap" situation whereby the high poverty levels render the supply of electricity to the poor unfeasible, yet without electricity the poor cannot change their economic situation or improve their livelihoods. However, there are limited marginal costs involved in selling additional power once the distribution system is set up. An effective route to financial viability is to improve local economic conditions by establishment of higher paying industrial and commercial customers.

Access to inexpensive electrification and materials: Because of the low financial returns on rural electrification investment, it is critical to lower the costs as far as possible to improve the returns. Invariably this means producing the materials and equipment as close to the place of use as possible. Or at least to produce it in-country. This has the added advantage of stimulating the local economy thus increasing incomes, leading to higher expenditure on electricity, leading to a more financially viable electrification.

Encouraging community participation in rural electrification: Involving the community in planning, designing and implementing projects could help address the operational and administrative difficulties in community electricity projects. Local people are more accepting of the tariff structure if they are involved throughout the project implementation process. But this demands community mobilisation and sensitisation, and a massive awareness campaign which encourages local people to invest in electricity projects. As potential consumers, they hold the key to the eventual success of any initiatives in rural electrification, and their early involvement in such initiatives can be critical.

STEPS AND PROCEDURES FOR SETTING UP MICRO-HYDRO BASED ELECTRIFICATION SCHEMES

An example is given below of the steps required to successfully implement a micro-hydro project under the subsidy programme of AEPC. Projects can be initiated by individuals, companies or community groups. In order to qualify for a subsidy strict criteria have to be met at all stages of the process- from feasibility study to completion.

The guidelines and criteria set for micro-hydro projects assist in ensuring the financial viability of the projects as well as ensuring the requisite quality standards.

Figure 13: Project cycle of a micro hydro (Source: AEPC, Nepa)l

RECOMMENDATIONS

Nepal's rural electrification experience has mainly focused on hydropower development, spearheaded by the government-owned Nepal Electricity Authority (NEA). Solar energy projects have also been encouraged through a subsidy grant system. The involvement of donors and other partners such as Intermediate Technology Development Group (ITDG) in Nepal's Rural Electrification program has also helped to accelerate the development of new projects through building technical skills among local people, and promoting the use appropriate technologies such as Electronic Load Controllers. Government's decision to provide electricity to all its District Administrative Centres, and the surging growth in the industrial sector in recent years further facilitated the electrification of rural areas in Nepal. The 1992 Electricity Act passed by government also strengthened the rural electrification sector.

The recommendations outlined below are some of the actions that need to be taken in order to increase the rate of access to electricity and also to enhance the positive impact on livelihoods.

- **Policy** - A clearly set out "National Electrification Policy" which lays out the vision and modalities for achieving national electrification is essential in order to have a common platform and goal for all those involved in electrification. This will enable lower levels of government at regional, district and village level, individuals, NGOs, CBOs and other organisations to assess for themselves how long they may have to wait and what initiatives they want to take and the additional investments required to speed up access. This will also help in the planning process and reduce time and resource wastage which are typical of existing ad-hoc programmes.
- **Skilled manpower:** The planned rate of electrification means that there will be a shortage of skilled manpower. Normal technical schools produce some manpower but this will not be sufficient. Bigger utilities also have their own training schemes and institutions but these are not generally available to the private sector. A dedicated public sector institute

to produce the necessary trained manpower is necessary in order to have sufficient trained manpower to build and operate electrification schemes. The increased employment opportunities will have a positive impact on livelihoods. A better trained workforce will also mean that power systems run more efficiently with an associated positive impact on livelihoods and the economy.

- **Finance:** Finance is the key to increasing access to electricity. Any policy of electrification must spell out clearly where the money is going to come from. Regardless of the scale of a central initiative, there must be a core electrification fund. Ideally, this would be in the form of a levy put on the present consumption of grid electricity. This is fair since those that are connected now are privileged in that they have electricity many years ahead of the rest of the population. Financing from commercial banks must also be leveraged to increase the size of the funds available and increase long-term sustainability. The involvement of commercial banks means that there is a check on whether the money is spent efficiently and whether the schemes are financially viable. Other forms of raising finance such as bonds, grants and soft loans from bilateral and multilateral donors can be considered as appropriate.
- **Utilising electricity:** In parallel with plans for electrification there must also be plans and budget to promote income generating activities using the available electricity. A systematic method for developing economic activities in electrification areas must be developed and applied. While some entrepreneurial activity will happen spontaneously this cannot be left to providence if electrification is to make a positive impact on the livelihoods of the poor.
- **Electrification technology and materials:** In order to bring down costs and maximise wider positive livelihood impacts there must be a policy of localising electrification technology and maximising the use of local materials and products. A systematic study of how to achieve this in the most effective way is needed.
- **Regulatory Framework:** A strong regulatory framework is required for the growing private sector that is getting involved in rural electrification projects. The increasing number of private organisations participating in community electricity projects demands consistent regulation by government especially with regard to monitoring the tariffs charged by different companies, and the quality of service, given to consumers. This function should be undertaken by an independent organisation.

Developing capacity in rural communities for initiating and designing electricity projects both for solar and hydropower is crucial to increasing electrification in the rural areas of Nepal. Capacity building would also involve imparting skills for funds acquisition, negotiation and marketing

This document is one output of PACE, focused on Nepal. The other countries researched under the PACE project are Ethiopia, Sri Lanka and Uganda. The diverse experience and approaches of the four countries studied during the PACE programme has provided insight into the issues of electrification in these countries. The four countries are at different stages of achievement regarding electrification and have made their own choices about how to move ahead. These differences are one reason why there is such a rich picking of lessons.

Of the three countries, the experience of Uganda is the one that is most interesting for Nepal. Uganda seems to have achieved what Nepal needs to achieve and vice versa. Uganda has put in place the financing mechanisms, the institutions and regulations to speed up electrification but lacks the technology base and experience that Nepal has developed over the years. Nepal has a better technology base but has yet to put in place the financing mechanisms, regulations and institutions for widespread and rapid electrification.

There cannot be any doubt that without electricity, economic development and hence poverty alleviation is impossible. All the attempts in other sectors such as health, education, communication will achieve only a fraction of what can be achieved if they are attempted without the flexibility and convenience of electricity.

Annex A – PACE Project Case Studies

Case Study: Small Hydropower Scheme, Tehrathum, Nepal

Background

Tehrathum is a small district stretching 697km^2 in Eastern Nepal, with a population of 114,000, and a relatively high literacy rate of 61 per cent. The district's main food crops include rice, maize, millet and wheat, while cash crops include oilseeds, potatoes, tobacco and cardamom, which only recently became a favourite among the farmers. The local communities also keep livestock including cattle, buffalo, sheep and goats.

Number of households	*20,000*
Electrified Households	*807*
Population	*114,000*
Number of males	*55,970*
Number of females	*58,453*
Electricity tariff	*Rs 6.80 a unit*

Table 10: Details of Tehrathum District

Though small in size, Tehrathum ranks among the ten most developed districts in Nepal, and boasts a per capita food surplus of 99 days. Firewood is the main energy source although the district also uses hydropower and biogas, both of which are being promoted and strongly supported by the UNDP's Renewable Energy Development Program (REDP).

Tehrathum's electricity supplies are generated by an off-grid small hydropower plant built in 1989 with a capacity of 100KW and also from the central grid. The plant provides power to the district's administrative centre and to six surrounding villages. The hydropower plant was built by the Government of Nepal as part of its policy to extend electricity to all the district administrative centres. With a total of 800 customers, the electricity supply is often disconnected in the evenings to avoid plant overload. Apart from the hospital, the army and the police quarters, customers experience load shedding every other day.

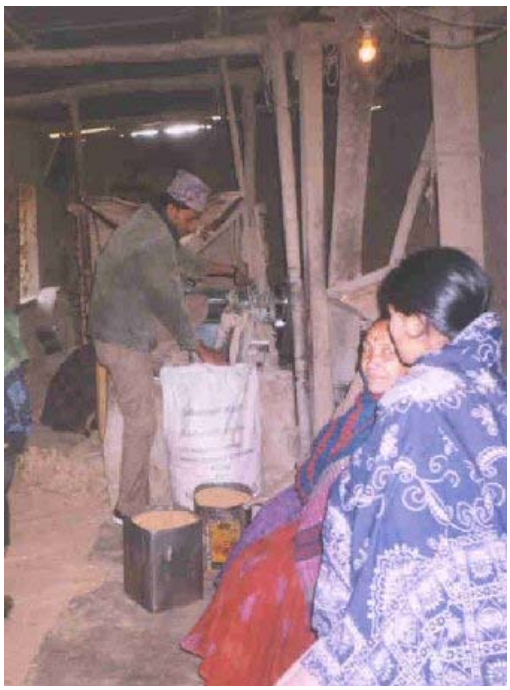

Figure 14: A mill uses electricity for operation and lighting

Although the national electricity grid has finally reached the district, this has not yet been synchronised with the hydropower plant. Power is supplied either from the grid or from the small hydro depending on the load. This has reduced load shedding to three days a week as grid electricity substitutes the locally generated electricity during peak hours.

Financing

Construction of the hydropower plant in Tehrathum was jointly funded by the Governments of Nepal and Japan, with technical assistance and construction equipment coming from Japan.

Public-Private Partnerships

Although the electrification of Tehrathum was initially a government-run venture, the government decided to lease it to the private sector since it was losing money on running the plant and as a step towards private sector involvement in the power sector.

In 1999, the management of the hydropower plant, including distribution activities and revenue collection, was contracted to a private sector company – Singha Bahini Bidyut (SBB).

SBB leases the system from the national electricity utility, Nepal Electricity Authority (NEA), and is also responsible for the repair costs. Although relations between the SBB and NEA have been difficult at times, the benefits of co-operation remain quite evident:

- NEA is now receiving an income instead of making a loss.
- More local people are employed in running the system than under NEA management.
- The performance of the system and, therefore, the quality of service to customers, has improved.

Access to Electricity

Livelihood benefits – Direct Consumers

Electricity breathed a new lease of life in Tehrathum district, with most households expressing satisfaction with the reliability of the service. However, with continued load shedding (for two and a half hours each time), complaints are not surprising. The majority of consumers in all income groups considered the price of electricity to be reasonable, and some were willing to pay more for an improved service.

All the customers surveyed (100%) said they mostly use the electricity for lighting and security, while 84% said they also use it for radio and television. Another 48% said they use it for cooking, while some 30% said they use it for refrigeration. At least 12% of the consumers use electricity for telecommunication purposes. Interestingly, none of the customers use electricity for direct income generation, and the consumption pattern shows that most customers are mostly interested in improving the quality of their lives.

	% of sample
Cooking	*48*
Refrigeration/Freezing	*30*
Lighting	*100*
TV and/or Radio	*84*
Telecommunications/IT	*12*
Security	*100*
Productive Uses	*0*
Other	*25*

Table 11: Use of electricity by households

Commercial and institutional users

Like households, institutions and commercial establishments mostly use electricity for lighting and security. However, access to electricity has improved institutional efficiency following the acquisition of photocopying machines, fax machines and computers. Most institutions and commercial users (88%) think the price of electricity is reasonable, and all of them said they would be willing to pay a higher price for better services. Institutions include schools (235), colleges (2), hospitals and government offices.

Computer teaching schools are also cropping up, and IT service companies are increasingly extending services to Tehrathum. Industries have also increased from six, four years ago, to ten today. Commercial users are the backbone of the district, and include mills, hotels and restaurants, among others. The service area has seven mills which provide various services such as grinding grain, hulling rice and expelling oil from oil seeds.

Benefit:
Milling is labour intensive and a very onerous task that would have to be done by women if there was no electricity to run the mills.

Livelihood benefits – Indirect Consumers

Households without electricity agreed that they are still able to enjoy the benefits of electrification, and are optimistic that they too will soon get connected. Although employment opportunities have not improved after electrification of the district, the community believe that they have benefited through better services, access to telecommunications, and lower prices for goods and services.

Both men and women mentioned health and education as the areas in which they have mainly benefited. Interesting to note is that a significantly higher proportion of women than men attributed the improvements in their livelihoods to electricity. This is probably because electricity has made it easier to carry out tasks such as rice hulling which they would otherwise have done manually. The introduction of office electronic equipment namely photocopiers, fax machines and computers has also widened the scope of opportunities for business as communication with the outside becomes easier.

Conclusions

Tehrathum district provides an example of how private sector management by the public sector can increase the performance and quality of service. Other key lessons and conclusions from this case are as follows:

- As electricity becomes available and is used for more and more purposes, this can lead to the establishment of new services that depend upon a reliable and quality service.
- For community electrification schemes to be sustainable, it is likely that investment will be required to improve and develop systems to ensure that the needs of all users can be met.
- Income generation for poverty reduction can be a slow process. For electrification to be effective in creating employment opportunities, attention needs to be paid to other aspects of the local economy such as skills, raw materials and markets.

Case Study: Micro Hydro Scheme, Ghandruk, Nepal

Background

Ghandruk is a small and well-established village in central Nepal, and a popular tourist destination, attracting both local and foreign tourists with its traditional Gurung lifestyles and old-world charm. In addition to tourism, the main sources of income are in agriculture and the military. The statistical details of Ghandruk village are provided in the table below.

No. of households	*1142*
Electrified Households	*278*
Total population	*5138*
Number of males	*2,497*
Number of females	*2,641*
Electricity tariff	*Rs 0.50 a watt*

Table 12: Statistical details of Ghandruk village

The thriving tourism industry paved way for investment in hotels and other related infrastructure, and tourist figures rose from 5000 in 1990 to 17,000 in 1999. Carpet weaving is another economic activity mostly undertaken by women. The main energy sources in Ghandruk are firewood, kerosene, LPG and electricity. Solar heaters are also commonly used by hotels for heating water which is seen as a special service to the tourists which generates income.

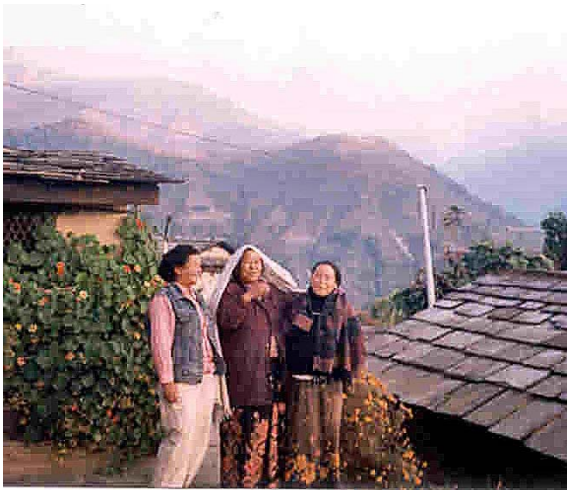

Figure 15: Residents of Ghandruk

Electricity in Ghandruk is supplied by an off-grid micro hydropower plant built in 1992 with assistance from Annapurna Area Conservation Project (ACAP), a non-governmental organisation working to preserve the area's natural resources. The hydropower plant has an output of 50kW.

Figure 16: Interior of Ghandruk power house

Financing

Construction of the hydropower plant cost Rs3.4 million (US$51,000) and was financed through a combination of loans, grants and both cash and in-kind contributions from the community. The project was initiated by the community leaders who mobilised the people in a fundraising drive, and approached ACAP for assistance. After 12 years of operation, the project is in a strong financial position. It has paid off the bank loan and has an annual operating profit of around 6% of the original cost of constructing the project. Given that the current tariff is well below those of similar projects, the present financial position is very favourable.

Public-Private Partnerships

The electrification of Ghandruk village required close co-operation between the community, the private sector, government and civil society. The Agricultural Bank of Nepal provided a loan; the Government of Nepal gave a grant, while ACAP helped with community mobilisation and financial aid.

A private company, Development and Consulting Services (DCS), was contracted to design and build the hydropower plant, while overall management of the project was left to the electrification committee which is elected from among the consumers. The committee recruited a manager and two operators and put them in charge of collecting revenues, levying fines from defaulting customers, and general operation of the plant.

An NGO, Intermediate Technology Development Group (ITDG), also participated by providing hotel owners with low wattage cookers. ACAP got involved with the project with the major aim of helping the community combine tourism with sustainable resource management.

Access to Electricity

Livelihood benefits – Direct Consumers

Electricity consumers in Ghandruk said they thought service delivery was highly reliable, but could not help complaining about their failure to get more electricity to their houses. Consumers initially connected small amounts of electricity believing that they would only need it for lighting up their houses. When they later need more electricity for their radios and television sets, it was too late. The hydropower plant was already running to capacity, so it was impossible to generate more electricity.

Cooking	*33%*
Refrigeration/freezing	*7%*
Lighting	*100%*
TV and/or radio	*88%*
Telecommunications/IT	*0%*
Security	*59%*
Productive uses	*0%*
Hot water	*26%*

Table 13: Use of electricity by households

Electricity is used for cooking and heating water by almost a third of households. This can be attributed largely to a flat tariff system and the promotion of low wattage cookers and hot water devices as part of the hydro project. Availability of hot water has encouraged improvements in personal hygiene as well as convenience in cooking.

Commercial and institutional users

Ghandruk has only a handful of institutions - one school, one health centre and ACAP. Since electrification, the health centre is able to sterilise its clinical equipment, which is a huge improvement to the days when they used kerosene to perform the same task. ACAP, however, is the institution that has reaped the largest share of benefits, including reduced fuel requirements, operation of audio-visual equipment, and introduction of computers and communication radios. The only school in Ghandruk village does not have electricity because it only operates during the day.

Commercial users have made the most of the electricity, especially since they were the main target of the electrification process. Many hotels and restaurants have switched from using local stoves to low wattage electric cookers, as promoted by ITDG.

Benefit: Hotels are now able to use washing machines, fridges, food processors, microwaves and toasters. The impact of this has been that they are able to provide a better a service to tourists and thus increase their incomes. They are also now able to attract new revenues by offering tourists hot water for bathing.

Livelihood benefits – Indirect Consumers

All households within the project area in Ghandruk have access to electricity. They also share the benefits of increasing opportunities in the local economy, and the improvement of local institutions, especially the health centre.

Figure 17: New hotel under construction in Ghandruk

Conclusions

The construction and management of the micro hydropower plant in Ghandruk is an example of a successful public private partnership.

- Community based electrification schemes especially microhydro) require a strong institutional support mechanism to succeed. In this case, ACAP's role has been crucial.
- Demand for power increases rapidly once the uses of electricity become known, and adequate planning is required if the economic and social benefits of electricity are to be maximised.
- Decisions on expansion and tariff-raising can be delayed due to conflicting interests and a need for consensus amongst users.
- Electricity can alleviate pressure on biomass resources for cooking and heating water. However, this must be supported by efforts to promote technologies to use electricity for these purposes.

Annex B - Stakeholders, their Roles and Responsibilities

Below are some of the main organisations involved in electrification in Nepal.

Stakeholder	*Roles and Responsibilities*
National Planning Commission	*Responsible for Five Year Plans. Long Range planning of energy needs and policies of the country*
Ministry of Water Resources	*Responsible for hydropower development, electrification*
Department of Electricity Development	*Responsible for licensing of electricity generation, transmission and distribution*
Nepal Electricity Authority	*National Utility, responsible for most of Nepal's electricity generation, transmission and distribution*
Alternative Energy Promotion Centre	*Promotion of alternative energy. Responsible for managing subsidies for micro-hydro and PV*
Rural Energy Development Program	*Provides assistance to communities to implement energy programmes, especially micro-hydro*
World Bank	*Lender to government for electricity generation, transmission and distribution. Also provides technical assistance*
Asian Development Bank	*Lender to government for electricity generation, transmission and distribution. Also provides technical assistance*
USAID	*Bilateral donor providing assistance in the power sector*
Winrock International, USA	*US NGO providing assistance in the power sector and electrification*
Small hydro promotion project, GTZ	*Promotes and provides assistance to the small hydro and electrification sector*
Energy Sector Assistance Programme	*Danish government programme supporting AEPC in its activities*
Small Hydropower Developers' Association	*Trade association of small hydropower developers*
Nepal Micro Hydropower Development Association	*Trade association of manufacturers of hydropower equipment*

Part IV: SRI LANKA

By

LGA Consultants Ltd

Contents: Part IV Sri Lanka

INTRODUCTION

Exploring ways of improving access to electricity is essential for poverty reduction and, with the emergence of service delivery through public-private partnerships, there is a growing concern that only the wealthiest members of communities will benefit. The main objective of the PACE project13 has been to review existing public-private partnerships in small-scale electrification projects in four countries, and develop an understanding of what is required to ensure that community-based electrification is both sustainable and able to deliver livelihood benefits to all social sectors.

Focusing on Sri Lanka, this document is one of four sets of National Guidelines that represent the key outputs of the PACE project. The other guidelines are for Ethiopia, Nepal and Uganda and the lessons from all four countries have been compiled into an International Guide14, which is aimed at international stakeholders actively involved in community electrification and poverty reduction programmes or projects.

One of the key issues for improving access to electricity through community-based schemes is that of sustainability. Unless an electrification scheme is sustainable from an economic, technical and managerial point of view, the immediate livelihood benefits will be short-lived, and long-term poverty reduction impossible. It is, therefore, difficult to assess the livelihood impacts and extent of access within community-based schemes without consideration of the scheme itself. Although these aspects have been analysed separately within PACE, they must be considered alongside each other.

This document has been designed to highlight the key issues that are emerging for community electrification processes in Sri Lanka, based on recent experience, and particularly in the context of current electricity sector reform.

In summary, the guide covers:

- The status of electricity sector reform and implications for poverty reduction
- Overview of current rural electrification activities and recent lessons
- Recommendations for sustainable and livelihoods-focused electrification policy.

The recommendations are aimed mainly at central government, and other actors involved in the restructuring process. However, they will also be of interest to provincial governments, private sector service providers, financial organisations and other stakeholders interested in the future of electrification and poverty alleviation in Sri Lanka.

[13] The PACE project has been funded by the UK Department for International Development (DfID).
[14] Give name of Guide and where it is available from.

STATUS OF ELECTRIFICATION AND ELECTRICITY SECTOR REFORM

The Ceylon Electricity Board (CEB), a government-owned utility company, is currently responsible for the generation, transmission and distribution of electricity in Sri Lanka. In the last few years, the CEB has made significant progress and has increased the extent of electrification from 25% in 1988 to 60%. However, CEB projections indicate that it will only be able to electrify 80% of the households in Sri Lanka in the long term, leaving around one million households dependent on off-grid options.

With the current restructuring of the electricity sector, the CEB may be divided into generation, transmission and distribution, with an increasing role for the private sector. Although this sector will be controlled by a regulator, the status of the off-grid energy sector and how it will be regulated to protect the consumer is yet to be established.

Access to electricity is mostly limited to households in urban areas. In the capital city of Colombo in the western province, 95% of households are grid connected. In certain northern, eastern and southern provinces, however, where the population is rural and dispersed, only 20% have access to the national grid. Off-grid technologies, therefore, have a vital role to play in rural electrification in Sri Lanka.

Population	*19 million*
Physical Area	*65,610sq km.*
GNP Per Capita	*US $ 1000*
Urban/Rural Population Mix	*25% Urban /75% Rural*
Electrification of Households (%)	*54%*
Power Generation (installed capacity)	*1,604MW*
Literacy Rate	*90%*
Annual Rainfall	*100cm (Dry Zone)* *500cm (Wet Zone)*
Mean Temperature (over land)	*26-28^{o}C*

Table 14: Country Statistics

The Human Development Index (HDI) for Sri Lanka is substantially above the average HDI value for developing countries, and electricity for the entire population is considered by the Sri Lankan government to be an important priority in maintaining this trend. This is because it recognises the potential impact that electricity can have on the quality of life and livelihoods of rural people.

Thus far, central government has focused only upon grid extension as a means of delivering electricity to rural areas and, despite its early involvement in the introduction of off-grid technologies such as solar PV, much of the dissemination of these technologies has been carried out by the private sector and NGOs.

Recently, provincial councils have played a key role in financially supporting off-grid initiatives (eg solar PV and micro hydro in the Uva and Sabaragamuwa provinces) and, along with the activity of other off-grid energy stakeholders, this is putting pressure on central government to acknowledge the role of off-grid technologies and integrate them into energy policy.

It is intended that current restructuring processes will address off-grid electrification, but continued lobbying is required to ensure that this remains on the agenda. The Energy Forum[15] and other NGOs, such as ITDG[16] and Citizen's Trust[17] are all actively engaged in keeping this issue alive.
As restructuring progresses, challenging issues will certainly emerge. In the current scenario, the roles are clear, with the CEB extending the grid, and private sector and NGOs developing off-grid initiatives. However, as the CEB is unbundled, the following sorts of questions will need to be addressed:

- Who will decide where to extend the grid and where to develop off-grid projects?
- Who will regulate off-grid projects for pricing and standards?
- Will distribution rights be given based on areas and regions (ie one distributor per area)?
- What will happen to existing community micro hydro projects (of which there are currently over 200)?
- What will be the role of provincial councils and divisional secretariats?
- If subsidies are provided by the provincial councils, how will they be administered?

These questions have important implications for delivery of off-grid electricity through public-private partnerships.

PUBLIC-PRIVATE PARTNERSHIPS AND ELECTRIFICATION

Over the last 25 years, Sri Lanka has seen numerous initiatives and partnerships aimed at promoting use of renewable energy for on and off-grid electrification. These have mainly been driven by the private sector and non-governmental organisations, but Government has played a crucial role in the process by introducing new technologies, as well as facilitating and funding new projects. This experience is summarised in Table 14.

In terms of public sector involvement and, as mentioned above, Sri Lanka's Provincial Councils are now becoming involved in supporting off-grid initiatives in various ways. Key examples of this are in Uva Province, where the Council has financially supported electrification through solar PV systems and, in the case of Sabaragamuwa province, local micro hydro projects. Much of this activity has been made possible through the ESD and RERED projects (see Table 15).

Funding for technical assistance has been a crucial element of these projects, and has been used to contract consulting companies who have the necessary expertise to assist the community in assessing the resource, system design, feasibility studies, preparation of bankable proposals and obtaining the necessary statutory approvals and bank funds to construct and commission the project. All this has helped to catalyse the development of successful and sustainable projects, and demonstrates the important role that the private sector can play in establishing electrification projects.

As well as introducing new technologies (biomass and wind) to its funding for new generation capacity18, the RERED project focuses on rural economic development, aiming to electrify 1,000 small enterprises and institutions through renewable energy sources. The mechanisms for achieving this include provision of technical assistance funds to tack on initiatives for income generation to the off-grid projects. RERED also has a cross-sectoral energy applications project to support rural economic development and facilities in the water, health and education sectors through access to energy services.

[15] Energy Forum is an independent, not for profit organisation whose objective is to promote renewable energy technologies to meet rural energy needs through networking, advocacy and consulting services.
[16] Intermediate Technology Development Group
[17] Citizen's Trust is a not for profit organisation whose objective is to be a public interest organisation focussing on development issues.
[18] RERED has a target of increasing Sri Lanka's capacity by 85MW.

1975	*Sri Lankan government worked with United Nations Environmental Programme (UNEP) and initiated Pattiyapola Rural Energy Demonstration Centre which used renewable energy sources such as solar PV, wind power and biogas to provide electricity to 200 families in the southern village of Pattiyapola.*
1980s	*Construction of micro hydropower plants pioneered by Intermediate Technology Development Group (ITDG).*
1980s	*Alternative Energy Unit, created in 1979 within CEB, implemented many activities to promote the use of renewable energy technologies, including solar PV, biogas, efficient fuelwood cookstoves and wind.*
1987	*Two new solar PV companies established: Power & Sun (Pvt.) Ltd which developed a retail market for SHS in rural areas, and Sunpower Systems Limited which implemented larger scale projects.*
1997-2002	*World Bank and government-funded Energy Services Delivery (ESD) project helped fund the development of micro hydro mini-grids, a grid-connected mini hydro sector and the commercial marketing of solar PV systems among rural households (programme size: US$ 57 million).*
2002-2007	*The Renewable Energy for Rural Economic Development (RERED) was established to follow the ESD project, but with added technologies of both off-grid and grid connected biomass and wind power (programme size: US$ 100 million).*
Current status	*Today there are a total of about 25,000 solar house systems in Sri Lanka, and 120 communities with micro hydropower projects. Over 3,000 households have also been connected to village hydro projects through the ESD project.*

Table 15: Chronology of Rural Electrification in Sri Lanka

RECENT LESSONS

Within the PACE project it has been possible to analyse the impacts of some of these examples of community electrification through public-private partnerships. Detailed case studies were carried out in three communities to explore the following community electrification projects:

Case Study 1: Solar home systems delivered within the Uva province in partnership with Uva Provincial Council, SEEDS[19], commercial banks and private sector technology providers.

Case Studies 2 and 3: Village hydro electrification schemes delivered in two communities (Hettikanda and Handunella) in the Sabaragamuwa province, in partnership with the local community, SEEDS, commercial banks, consultants (CAPS Ltd), and the Sabaragamuwa provincial government (who provided a financial subsidy for both.).

Both projects have received financial support from the World Bank's ESD programme and, as indicated above, have involved a number of public and private sector partners.

The case studies highlight the way in which the various actors have worked together to achieve these projects, and offer valuable lessons for other communities and electrification stakeholders – both in terms of successful implementation and livelihood impacts.

Project implementation processes: Initiation, finance, structure, levels of stakeholder involvement, tariff arrangements, management, maintenance and general sustainability.

[19] Sarvodaya Economic Enterprises Development Services (SEEDS) is Sri Lanka's largest micro-finance institution.

Even in a resource-constrained environment, local authorities can play a key role in delivering electricity to communities

To meet their objective of improving access to electricity in the province, Uva Provincial Council decided to divert their budget for grid extension to the provision of subsidies for the purchase of household solar PV systems. At a rate of Rs10,000 (£67 sterling per unit), they calculated that they would be able to part-finance 45,000 units in five years. In addition to this financing role, they have also ensured that high levels of service to households are maintained, through a monitoring process. This has brought safety and quality benefits to the consumers and has strengthened the reputation, both of solar energy itself, and of private sector technology and service providers amongst the local people, some of whom had a poor experience with solar home systems in the past.

Box 11: The role of local authorities

Livelihood impacts: Analysis of both direct and indirect access to electricity in the domestic, commercial and institutional sectors.

The key lessons learned are described in the following section, and illustrated with examples from the case studies, full versions of which are available at http://pace.energyprojects.net.

PROJECT IMPLEMENTATION

In most off-grid rural electrification schemes, consumers have to pay for the service upfront, as in the case of solar home systems, or have to participate in the planning and administration of projects as in the case of micro hydropower projects. The requirement for consumer participation puts off-grid electricity community at great risk as they have to invest their funds and time for a project from the inception with no guarantee that the project will be completed. The success of a project requires not only the participation of the community, but also statutory approvals, bank loans and the subsidies. Public-private partnerships can help to share this risk and hence ease the burden on communities.

Local authorities can play a crucial role in ensuring that private sector participants deliver adequate quality and safety to consumers (see Box 11).

Private sector participants can secure a strong customer base and future business when they respond well to consumer protection standards.

Community based off-grid micro hydro projects require leadership and cooperation from community members, as well as outside assistance in project design, acquisition of funds, and installation and maintenance of equipment.

Awareness-raising is necessary amongst consumers to avoid problems relating to system overloads, and to ensure that community participation is secured in ongoing maintenance.

*Access to electricity in one of the village hydro schemes has been seriously affected by **local politics**. Following promises that grid extension would reach the community in the foreseeable future, half of the original participants in the scheme opted out. After three years, the grid has still not reached the area, leaving half of the local population with a missed opportunity. While extension of the scheme to those community members is technically possible, it will require considerably more financial and physical resources to achieve, than if planned for at the outset.*

Box 12: The politics of electrification

Misinformation on grid extension plans lead to false hopes, with the result that potential electrification schemes may be stalled (see Box 12).

Central government (through divisional secretariats) is responsible for approvals for land and water use and provincial councils have no control over this. The process is currently very lengthy and requires support from external experts.

Legal obstacles (according to the Electricity Act) mean that communities cannot generate and sell electricity. Therefore, Electrical Consumer Societies (ECSs) operating as cooperatives are necessary in order for communities to develop off-grid electricity projects. Here, there is no sale of electricity, but only a collection of membership fees.

At present, banks are willing to invest in off-grid projects as incentives are available through the RERED project. This interest may not be there after project ends in 2007.

LIVELIHOOD IMPACTS

PV solar home systems bring various benefits to the different members of a household and, although they can yield some indirect benefits to non-electrified community members, they are limited in their potential to stimulate local economies (see Box 13).

Micro hydro initiatives present more opportunities for income generation as the power output is higher at a community level. However, there are other challenges in developing these projects stemming from the need for the community to work together. Good leadership and teamwork is key to successful project development.

For households with solar home systems, there is no doubt about the benefits that they can enjoy. Electric lighting allows household members to pursue after-school education activities, and improves their health through the reduction of kerosene use. There are also gender-related benefits. When women do not have to rely on daytime lighting to prepare food, this means that they can pursue other economic activities during the day, such as helping the spouse in adding value in the agriculture area or develop a sewing business for instance.

In terms of its wider benefit, the project in Uva has boosted the local economy in the sense that new skills are being brought to the community. The Solar Industries Association has assisted in training 394 technicians across Sri Lanka and the Uva initiative was one of the reasons, as it is expected to be followed by the other provinces.

Aside from this aspect, however, solar home systems are limited in their livelihood impacts outside each individual household. Since it is only those who are already relatively wealthy that qualify for the subsidised systems, poor households in the Uva province remain excluded from the process.

Box 13: Benefits and limitations of solar home systems

Since it is not always possible for entire communities to obtain a household connection, there is an opportunity for public authorities to ensure that their support for electrification projects will maximise indirect benefits, eg through institutional access and promotion of income-generation activities (see Box 14).

While increased commercial and institutional use of electricity is a key way to extend the benefits of electricity beyond the household level and to poorer members of a community, it is important to remember that the presence of electricity will not automatically lead to such use, and that effort is required to promote and facilitate this.

Further research and practical demonstration is required to identify how income-generation activities can be successfully promoted and provided for when planning community-based electrification systems.

Extending livelihood benefits beyond connected households

Higher capacity systems such as micro-hydro plants have the potential to power a broader range of facilities than solar home systems. In the case of the Kitulgala village hydro project, in the Sabaragamuwa Province, benefits are already being extended to those members of the community who are not directly connected to the system.

With few institutions or commercial enterprises, the community can still provide free electricity to the local temple and has chosen to offer a temporary connection to unconnected households when there is a special occasion, such as a wedding or funeral. A battery-charging service has also been established, and refrigeration benefits are being shared within the community. Currently, however, the full capacity of the system is not being utilized during the daytime, presenting an opportunity for initiating new income-generation activities that will use the electricity during that time.

With so many villagers employed in the tea plantations, increasing household incomes is not such a high priority for this community. However, the opportunity to diversify the local employment base, reduce dependence on services from the nearest town, or retain young people in the village may be more compelling drivers for maximizing the economic potential of this unused capacity.

Box 14: Extending livelihood benefits

Devolution of power to the provinces has strengthened the local governments' authority and mandate to make electricity available to rural areas. However, clear guidelines and policies to demarcate areas of responsibility between the government-owned CEB and the provincial council energy ministers should be developed.

Affordable repayments will help to ensure the financial sustainability of projects, which in itself is the most important requirement for ensuring access. Local actors require guidance on how to undertake socio-economic analysis that will help them to establish acceptable and realistic repayment rates or tariffs.

When planning for an electrification project is not carried out with the participation of all key stakeholders, there is a risk that access will be limited, and electricity provision will not respond to the most urgent local needs (see Box 15).

The role of planning in ensuring appropriate systems that favour wide access

Uva Provincial Council recognises the limitations for livelihood improvement through solar home systems alone. For this reason, the Council is also undertaking a strategic plan to assess local hydro, wind and biomass resources and identify potential sites for further electrification projects.

Combining this technical aspect of planning with the ongoing consultation work that is being undertaken by the Rural Development Society (part-funded by the Council) on local needs and aspirations in the Province will be an important step to identifying appropriate systems that respond to the needs of individual communities.

In some cases, solar home systems may be an adequate means of meeting local energy requirements, or may be useful in supplementing other electricity generation, whilst in other communities the need to improve education, health or employment opportunities may justify additional investment in higher capacity systems that will bring electricity to schools, hospitals and local businesses. A sustainable planning process is the first step in ensuring that the benefits of electrification reach the poorest in communities.

Box 15: The role of planning

Other actors who are either embarking on, or already in the process of developing community electrification projects, can benefit from this experience. However, there are still some important considerations that go beyond the lessons learnt in the three cases examined within PACE.

THE WAY FORWARD – OPPORTUNITIES, CHALLENGES AND PROGRESS

OPPORTUNITIES

In 1995, it was estimated that there were around 30,000 solar PV systems meeting basic electricity requirements in Sri Lanka, with a further market of about 300,000 households20. Four major companies and a few smaller operations are currently active in the market. With finance as a major barrier, the success so far in this market development process has been through private sector vendor/micro-financing partnerships, eg Sarvodaya (SEEDS). There is also now a large government bank (Bank of Ceylon) and a private leasing company (Ceylinco Leasing) providing grassroots level financing.

Approximately 200 micro hydro schemes already exist in Sri Lanka. However, judging by requests for assistance to ITDG, Sri Lanka Business Development Centre, RERED-Administration Unit and Energy Forum from rural communities with a water source, there are an estimated 1,000 future project sites.

CHALLENGES

Transforming these market opportunities into sustainable electrification projects will require a number of important issues to be considered and addressed. Solutions to these will be important in creating an environment in which public private partnerships for community electrification can develop. In this section, these issues are divided into short and long-term challenges.

Short-term

The following short-term issues relate to some current problems in the way that the support for community electrification is administered:

Unless the agencies responsible for administering the grants and subsidies (the RERED project Administration Unit and the provincial councils) improve their understanding and appreciation of the

[20] Solar Power & Light Company Ltd, 1995

difficulties facing businesses and communities, and are more responsive to them, this will stall progress of off-grid electrification by the private sector. This also applies to government institutions and the banking sector (see Box 16).

An example of the needs of a small, rural business involved in off-grid electrification

Most unelectrified households are located in remote areas, meaning that vendors and finance providers have to establish infrastructure as close as possible to those households in order to provide service and collect repayments. This creates additional costs for the organisations involved in service provision and finance. In theory, provincial government subsidies to the end-users can help to increase market coverage, whilst GEF grants to vendors of RERED project certified systems will help to mitigate some of the high costs of doing business. In reality, however, access to these schemes is often stalled by bureaucratic bottlenecks.

Box 16: The needs of rural business

The licensing process, which is currently both lengthy and cumbersome, is another example of a bureaucratic bottleneck, which can burden project developers with delays and additional costs.

A new initiative called the "Deepaloka" which is using bi-lateral donor aid from countries like China and Kuwait is extending the grid to remote areas. Though good for rural consumers, this political initiative must be coordinated with the private vendors and developers of off-grid systems.

Long-term

The following longer term issues relate to how the current critical mass that is being built will be sustained once the donor and government support programmes reach completion:

RERED has technical assistance funds available to assist rural communities (through outside expert interventions) to develop micro hydro and biomass projects. It also provides GEF grants for off-grid solar PV and micro hydro projects. All this contributes towards the development of the off-grid rural energy markets in general. For instance, solar PV vendors welcome the GEF grant provided per system (approximately US $ 60 per system) as it helps to mitigate the high cost of operating regional centres for sales and service. The grant is also a welcome break for rural communities who have to raise funds for micro hydro projects (US $ 400 per kW). Yet, the RERED project ends in 2007 and the government will have to establish other avenues to fund off-grid electrification or provide incentives for private sector to invest in the area.

At present, micro hydro projects are not strictly legal according to the existing Electricity Act which stipulates that only the CEB can generate and sell electricity. The Electricity Consumer Societies currently get around this by registering as community cooperatives, and charging a membership fee from consumers, rather than a tariff. While funds are available under the RERED project, quality and safety standards will be met. However, there is no plan for how this can be ensured once the project ends in 2007. It is, therefore, hoped that this issue will be addressed in the new Electricity Act.

As restructuring of the electricity sector progresses, consideration of the following will also be important in the development of the legal and regulatory framework that is likely to govern off-grid electrification:

The proposed Electricity Reform Act (under Section 12(4)) states that "A person shall not be granted both a generation license and a distribution license". This maintains the illegal status of off-grid micro hydro projects. However, under Section 9 of the Act, it is possible to grant an exemption from this, either for all off-grid projects below 100 kW or on a case by case basis.

Exemption has the potential, however, to comprise quality and safety standards, and adversely affect consumers. It would also remove the power from the new regulator, Public Utilities Commission of Sri Lanka (PUCSL) to regulate pricing and safety standards. There is currently some degree of self-

regulation within community based (cooperative) schemes, but it is still a potential problem, and could become more so if the private sector becomes involved in off-grid projects to generate and distribute electricity.

A further problem associated with exemption is the limitation of rights for the off-grid distributor to collect payments and to disconnect systems. The operator would be open to legal challenges in this area.

Provincial councils have concurrent status[21] on electrification and some provinces are already proactively involved in off-grid electricity promotions through subsidies and other forms of support. However, there is currently minimal dialogue between the central government Ministry of Energy and the provincial governments. If PUCSL and the ministry do not engage the provincial councils at this stage, processes may be established without their inputs and involvement, which will leave a substantial void in this area. This void will lead to slowing of off-grid electrification project development as financiers would lose confidence in the process.

Politicisation of rural electrification remains an issue. The CEB is often reluctant to provide grid extension information to off-grid developers and vendors as politicians can overrule these plans and influence the CEB to extend the grid to areas that may not be financial viable.

PROGRESS

Within the PACE project, the Energy Forum has been exploring the potential role of provincial councils in the licensing process, for which they are not currently responsible. This, coupled with the fact that the government is leaning towards a faster and less cumbersome licensing process, could mean that this short-term obstacle to successful project development will soon be removed.

In terms of provincial council involvement in off-grid electrification, the Energy Forum has been working with the nine provincial councils to establish some common policies in electrification and regulation. However, as indicated in the previous section, the Ministry of Energy and PUCSL must engage in dialogue with the provincial councils to ensure that national and provincial level regulations are complementary.

Provincial councils have been working with the Energy Forum to establish a Federation of Micro Hydro Electricity Consumer Societies that will provide support to community based projects.

In terms of the politicisation of rural electrification, it is hoped that the unbundling of the sector may leave the politicians without direct influence in this process, which will prevent the recurrence of situations where this has hampered development of community projects (see Box 13).

CONCLUSIONS

In light of the current restructuring process, and the fact that off-grid electrification is yet to be integrated into the legal and regulatory framework that governs Sri Lanka's electricity sector, projects are being developed in an informal way. The Electricity Reform Act 2002 will formalise the process to some degree, as off-grid electricity generation systems develop.

Unless provincial councils become involved in solar PV provision, for example through subsidies, micro-financing or through monitoring the supply, this type of electrification is likely to remain relatively informal. This is because individual systems are usually sold on a commercial basis, and at a retail level.

For community-based micro-hydro projects, however, a more formalised approach is appropriate. Regulation is important, because projects include the participation of many people as well as the generation and distribution of 220 Volt AC power, which requires a high degree of safety and

[21] Based on the 13th amendment of the constitution.

standards to ensure that accidents do not occur. Regulation will also increase participation of established private sector developers, and build confidence in the process.

The following table indicates the advantages and the disadvantages of the formal and informal approaches.

Formal Approach	
Advantages	*Disadvantages*
Regulation will increase the legitimacy of the sector with mainstream institutions such as banks, financiers and investors	*Will increase costs of developing systems*
Enforce standards for minimum service and safety.	*Less financially attractive for private sector investors and venture capital funds*
Regulation of tariffs to consumers	*More bureaucratic processes for developers*
Consumers have recourse to poor service	*Potential for bureaucratic interference*
Informal Approach	
Advantages	*Disadvantages*
Can operate an off-grid project with minimum government interference (as it is being done currently as it requires only local authority approval for land and water use as well as environmental clearance)	*Risk to consumers high due to no safety and service standards.*
No stipulated minimum standard will lower costs of developing a system	*Ad hoc development of projects will hamper a systematic process for national rural development*
Will be attractive for informal private sector developers (entrepreneurs)	*Will not attract established private sector investors and venture capital investors*

Table 16: Formal versus Informal Approaches to Community Electricity Schemes

It is timely, therefore, to establish some formalized procedures for off-grid electrification schemes. However, as indicated above, this has to be done in the interest of the rural consumers, as well as vendors, developers and financiers and, in formalising the area, the government has to ensure that the development of these projects does not get stalled with a difficult and expensive regulation process. There has to be a good balance to ensure that the rural consumers get a quality electricity service at a reasonable price. At the same time, it must encourage the private sector and NGOs to participate in the process in partnership with the government. Here, the central government has to work with the provincial councils and agree on areas of jurisdiction for regulation.

Many of the financial barriers for off-grid energy development have been addressed through the public-private partnerships and initiatives such as the ESD/RERED. Therefore, a solid foundation for development using solar PV (decentralized) and micro hydro (community-based) is being established. These models can be replicated when new technologies such as biomass, biogas and wind power also begin to be utilised.

Therefore, whilst one donor driven government initiative (the ESD/RERED project) has actually catalysed the development of the off-grid electricity sector by removing traditional financial and technological barriers, the electricity sector restructuring process is creating uncertainty.

Lack of transparency within this process in the early stages has left off-grid energy stakeholders guessing what will happen when the sector is unbundled and privatized. However, from August 2003 there has been much better engagement of stakeholders through the Public Utilities Commission (PUCSL) which is a government agency facilitating the restructuring of public utilities (water, electricity, telecom etc.). PUCSL will be the regulator of the electricity sector.

The issues related to off-grid electrification are being raised with the PUCSL by stakeholders such as the Energy Forum, so they can be addressed before the process is formalized.

Yet many questions remain unanswered and may not be addressed due to the pressure the government has from the donors (who exactly?) to restructure the sector before mid 2004. Roles and the rights of the various stakeholders are not clear when the distribution to the regions will be handed over to private entities.

For instance:

- How will the private companies view the independent micro hydro developers and the future biomass energy developers in their region?
- How can these projects be integrated to the grid if and when it arrives to these off-grid areas and who will own them?
- Will PUCSL regulate the price of electricity in off-grid community projects and how will it deal with the individual solar PV systems?
- What role would the provincial councils play in funding and regulating off-grid projects?
- Would the apex body, Federation of Micro Hydro Electricity Consumer Societies be able to represent the voice of these communities?

These are some of the questions that have to be addressed in the process of restructuring.

RECOMMENDATIONS FOR ACCELERATION OF OFF-GRID COMMUNITY ELECTRICITY

The following are some recommendations for the government in order to continue the development of the off-grid rural electrification sector. These recommendations are made in the context of the government's goal to electrify 80% of households 2010 with the grid, which would still leave 1 million households unelectrified. The recommendations, therefore, are made with a view that the government will incorporate off-grid technologies that have been thus far informally disseminated in order to achieve a near 100% electrification of the country.

Currently, the government has a window to incorporate off-grid with the grid through the energy sector restructuring process. If this chance is missed, the off-grid sector will be affected in such a way that could deny the remaining 20% access to electricity at a reasonable cost. Therefore, the most important recommendation is that the government should not make hasty decisions on the fate of off-grid electricity developments. Rather, it should engage all the affected parties in a transparent dialogue. Sri Lanka must also learn from the lessons of other countries who have restructured the sector in the recent past. PUCSL is attempting to do this, but the government is under pressure from the donors to complete this process sooner than later.

There has also been a donor push to link energy and poverty alleviation. One of the government's priority development goals is to eradicate poverty and it is accepted that energy is a requirement for improving livelihoods. However, electrification alone will not stimulate a rural community economy.

There has to be a sound macro economic climate in order to improve local economies. Once that is in place, there must also be markets for produce, access to markets through roads and telecommunications and training in entrepreneurship and business development. Therefore, the government must also look at energy as a part of a larger holistic system of development and donors should support this process accordingly.

For instance, the ESD and RERED projects are stand-alone projects and expecting them to have a significant impact on livelihoods is unreasonable. Although they will have a positive impact in terms of building capacity, meeting immediate electricity needs and increasing quality of life through education, health and well-being, longer-term livelihood impacts and economic development will be a longer process. For this reason, there needs to be better coordination between the donor community and the government in the area of development. As a cross-cutting issue, energy must be addressed in conjunction with the development of other sectors. The following are specific recommendations for key stakeholders:

NATIONAL GOVERNMENT

- Integration of on and off-grid based rural electrification into the legal and policy framework to ensure a level playing field for meeting rural people's energy needs is crucial.
- The off-grid sector must not be left alone through exemptions, but have some regulation to ensure that the consumers are protected as well investors are confident to develop projects. The central government can partner with the provincial governments in this process, as they are closer to their constituency.
- Central government could support the development of off-grid hydro and biomass projects through the streamlining of the approval process. Common guidelines could be prepared for entire provinces.
- The private and non-governmental financial sector at the urban and rural levels will only participate in these projects if they have the confidence that the funds will provide them a return on their investment. Therefore, it is even more important for the government to play the role as a facilitator and an enabler to develop these rural energy projects.
- The provincial councils were established to devolve power so that the regional population will be better served in areas such as education, healthcare, energy roads and other infrastructure areas. In this case, the national Ministry of Energy has to engage the provincial energy ministries to develop criteria for sharing the responsibility of rural electrification using both grid based and off-grid systems.
- For this sector to develop in a manner that will lead to poverty reduction and longer term livelihood benefits, central government should link the cross-sectoral energy requirements by coordinating agriculture (water pumping, drip irrigation, chilling of produce, processing etc.), communications (internet, telecom), education (distance education, adult education, vocational training etc.), health care (refrigeration etc.) areas. This requires co-ordination between the various ministries responsible, eg finance, environment, agriculture, rural development, land and water resources.

REGULATOR

The Public Utilities Commission (PUCSL) has to establish a balanced process for regulation of the off-grid sector, and must address the following areas:

- Whether off-grid systems will be licensed or exempted from the requirement in whole or in part;
- If the systems are licensed, how would it ensure that the standards are not so high and the process not so stringent that it will cause a barrier to development
- If these systems are exempted, then;

- What conditions will be attached to such exemptions?
- Establish the need to set, monitor and enforce maximum tariff levels and minimum service standards
- How will they be provided in the absence of a licence?

Off-grid energy systems being located in the regions would make it difficult for the PUCSL based in Colombo to administer. As such, the central government has to work with the provincial governments to provide this regulation.

Annex A - PACE Project Case Studies

Case Study: Micro Hydro Projects in Hettikanda and Handunella Villages

Background

The villages of Hettikanda and Handunella in Southern and Central Sri Lanka may be geographically separate, but their experiences in efforts to get electricity are quite similar. The two communities mainly survive on tea cultivation although there is also some trading and agricultural activity in Handunella.

The smaller of the two, Hettikanda, has a population of 210 people with just 35 households, 23 of which have access to electricity. The population of Handunella is a lot bigger at 650, and 50 of its 100 households have access to electricity. A summary of the two communities is provided in the table below.

	Hettikanda	*Handunella*
Total Population	*210*	*650*
No. of households	*35*	*100*
Electrified households	*23*	*50*
Electricity tariff a month	*Rs.700 ($7)*	*Rs.485 ($5)*
Total cost of electrification	*Rs.977,000 ($10,072)*	*Rs.1,480,000 ($15,257)*
Capacity of hydro plant	*7kw*	*10kw*

Table 17: Electrification details for Hettikanda and Handunella villages

Before electrification, both communities mostly relied on kerosene for lighting, while a few affluent families were able to use generators. Wet batteries for operating television sets and dry batteries for operating radio sets were also very much in use.

They each decided to build their own hydropower plants after realising that the national electricity utility, Ceylon Electricity Board (CEB) would not be connecting them to the national electricity grid any time soon because of the astronomical costs involved.

With guidance and assistance from local politicians and private sector companies, they each formed themselves into an Electricity Consumers Society (ECS), kick-starting and implementing the project that would get electricity to their villages. The Hettikanda Village Hydro ECS and the Handunella Hydropower Company (in Handunella) played a pivotal role in the electrification of their respective villages.

Financing

Electrification of both the Hettikanda and Handunella communities was made possible by a combination of equity investment by the ECS, a grant from the Global Environment Facility (GEF), and a bank loan payable over a five-year period. The Hettikanda community contributed Rs.200,000, and this was topped up with a GEF grant of Rs.168,000 and a loan from the Hatton National Bank of Rs.609,000. The Handunella community contributed Rs.408,000, and this was topped up with a GEF grant of 272,000 under the Energy Services Delivery (ESD) project, and a loan from Sampath Bank of Rs.800,000.

Figure 18: Survey being conducted in a house receiving electricity from the project

Public-Private Partnerships

Figure 19: An example of a penstock at the source of the hydro intake. In Hettikanda and Handunella, this was built by the community

The hydropower plants in Hettikanda and Handunella are good examples of successful public private partnerships. The banks, the local governments, the community and the private sector all made a tremendous contribution in constructing the power plants. The residents of both communities contributed more than equity funds, they also contributed sweat equity because they carried out a lot of the preliminary construction work.

The private sector companies supplied construction materials, provided after-sales services and trained some members of the community in plant maintenance and other technical activities. The donors and the banks filled the funding gap by giving grants and loans, with favourable payment terms including a 5-year grace period. Both communities have already paid off their loans. This is not to say, however, that there were not difficulties on the way.

Obstacles

- Inadequacy of government institutional policy guidelines for approving village hydro projects (registration of the CBO as a legal body, approval for use of waterways, permission to set up the project in the designated area, approval from the central environmental Authority etc.)
- Non accessibility of CEB (Ceylon Electricity Board) grid extension plans. (Developer has to be sure that the national grid will not be extended to the project area in the near future).
- Political interference (eg politicians promising grid extensions to the area, for short term political gains, when they genuinely know that it is not possible).
- Inadequacy of technical know-how in rural areas.
- Problems in obtaining loan finance from banks.
- Non co-operation by some members of the ECS in contributing their labour for project implementation.

Solutions

- In solving the above problems, intervention of the project consultancy company was obtained. The project consultants also intervened in solving other institutional and technical issues, which made an enormous difference to the ability of the community to develop these projects successfully.

Access to Electricity

Livelihood benefits – Direct Consumers

Electricity is always sure to help improve people's livelihoods, especially in facilitating the use of labour saving appliances, and in improving quality of life. The story is no different in Hettikanda and Handunella where electrification has resulted in improvements to health and education, as well as better access to information through radio and television. Most importantly, injuries due to bottle lamp accidents have declined, and school children are studying longer hours at night.

Examples of benefits

1) Respiratory illnesses due to inhalation of kerosene fumes have been reduced. Some mothers said that before switching to electricity, the soft cotton they use to clean their babies' nostrils always came out black. That is no more.
2) Households revealed that when they used kerosene lamps, they painted their houses every year because the walls discoloured frequently due to kerosene fumes. With electricity, this is no longer necessary.

Commercial and institutional users

There are no institutional users of electricity in either Hettikanda or Handunella villages, and only one commercial user in Handunella – a grocery selling refrigerated foods.

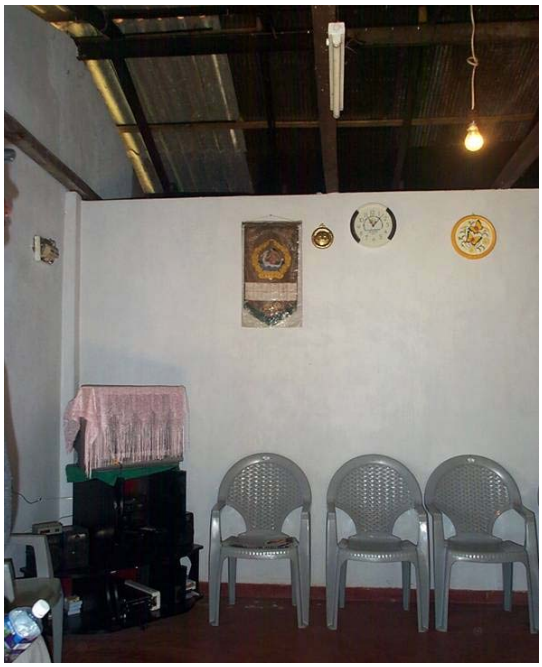

Figure 20: Electricity is mainly used for lighting and entertainment

Livelihood benefits – Indirect Consumers

Although nearly all households in Hettikanda and Handunella can afford electricity, only half of them actually have access. The experience of Handunella demonstrates how misinformation and the subsequent inability to make adequate plans have restricted access to electricity in the community.

At the initiation of the project, all 100 households joined the management society and plans were designed for supplying electricity to all households. However, at a later stage, half the households abandoned the scheme following promises of electrification by politicians in an election campaign. Three years later, the grid has still yet to arrive in the area, and the capacity of the existing system is inadequate for extension to those unconnected households.

Despite this, many unconnected households, especially in Handunella, said they have benefited from the electrification program in a variety of ways, including being able to have their batteries charged within the village instead of trekking to the nearest electrified village and getting refrigerated drinks and food from the village grocery.

In addition, residents have benefited socially through the formation of strong networks in implementing and managing the electrification process. As is to be expected with a project of this nature, there were a number of obstacles to be overcome.

- Over-usage of electricity by consumers, and subsequent tripping of the system.
- Consumers buying equipment that consume more than the wattage allocated for a single household.
- Diminishing co-operation of all members of ECS in participating in maintenance activities of the project.
- Deterioration of wooden poles installed for the power distribution system at the inception.

These problems are gradually being overcome through a combination of awareness-raising by the project consultants and the ECS leadership.

Conclusions

Hettikanda and Handunella villages demonstrate how successful public-private partnerships can be developed in order to provide rural communities with electricity. However, there is still much room for improvement if future projects are to be developed smoothly, and bring real benefits to all members of the community:

1. Central government should issue uniform guidelines and directives to divisional/local government authorities for issuing approvals for village hydro projects in all relevant provinces and for legal registration of ECS.

2. The CEB should assist projects by releasing information of their short/medium term grid extension plans to prospective village hydro project sites.

3. All relevant Provincial Councils should adopt a uniform and transparent scheme for assisting the village hydro projects.

Case Study: Solar PV Home Systems, Uva Province, Sri Lanka

Background

The Uva Solar Photovoltaic (PV) Project was initiated to provide alternative energy supply to unelectrified households in the districts of Badulla and Moneragala, located in the south-east area of Sri Lanka, in the Uva province.

Number of Households in Uva province	*252,427*
Electrified Households in Uva province	*98,407 or 39%*
Electrified Households in Badulla District	*47.7%*
Electrified Households in Moneragala District	*21%*
Average cost of Draw CEB grid to a house in Badulla	*Rs.45,000*
Average cost of Draw CEB grid to a house in Moneragala	*Rs.65,000*
Estimated time required to extend CEB grid to all households in Uva	*40 years*

(Rs = Sri Lankan Rupees)

Electrification was identified as a priority for the province for a number of reasons. These included social inequality resulting from the variable levels of access to electricity, and negative health and education aspects of using kerosene for lighting.

Despite this need for electrification, extension of the grid to these districts was considered to be economically unfeasible and the Ceylon Electricity Board was unable to justify extension of the grid for social reasons alone. After a review of the alternative options, the Provincial Council decided on a solution of diverting their budget for grid extension to the provision of subsidies for the purchase of household solar PV systems. At a rate of Rs10,000 per unit, they would be able to part-finance 45,000 units in five years.

Figure 21: Photovoltaic panel on the roof of a private home

Financing

After the Rs10,000 subsidies, the remaining costs of the systems were financed either through micro-finance (SEEDS) or bank credit (Bank of Ceylon). Typically, a user would pay a 25% down payment, paying the balance over a period of 3-5 years at interest rates between 16 and 22% (depending on customer risk, or the distance from a SEEDS office or a bank). Overall, 6,012 systems have been installed in this project so far, with a further 4,000 requests for systems.

Public-Private Partnerships

There has been strong cooperation between the public and private sector in this project, playing the following key roles:

Private

Solar PV dealers and equipment suppliers are responsible for the marketing and sales of systems, as well as installation, training and after sales services.

Micro Finance Institutions (MFIs) and private banks have been involved in providing loans to households who have purchased systems.

Public

In addition to subsidies, the Council has played a key role in monitoring the project, to ensure that high levels of service to households are maintained.

Access to Electricity

Livelihood benefits – Direct Consumers

End user perspectives indicate that the service to households with solar systems provided under this project has been very good, and this is believed to be a result of the monitoring that is being carried out by the Provincial Council. This is in contrast to users of older systems who said that poor service delivery had tainted the view of solar PV systems amongst the local community. Households with PV systems are mainly benefiting from the health and education improvements that are associated with electric lighting, as well as the benefits of TV and radio access.

Examples of benefits: Before the installation of solar PV system, most female household members cooked their dinner during daytime in order to avoid the inconvenience of cooking using a bottle lamp. With electricity from Solar PV system being available, these females are now able do their cooking at night, thereby saving more time during the day for other useful work.

Commercial use

Two village shops in the district are now benefiting from solar home systems, meaning that they can extend their opening hours, providing the opportunity to increase their income.

In addition to users of the solar home systems, this project has contributed to the local economy in the sense that new companies are being established locally, and skills are being brought to the community. 394 technicians have now been trained to support the project.

Figure 22: A PV system installed in the local shop

Livelihood benefits – Indirect Consumers

In this particular case, PV systems have only been provided to households that meet the following criteria for receipt of the subsidy:

- Grid would not reach in 5 years at least.
- Own the house.
- Be a resident of Uva.
- Be able to afford system and pay back loan to MFI (SEEDS).
- Be more than 1.8km from the nearest grid.
- Have school-age children.
- Have transport difficulties.
- MFI (SEEDS) could lend to the household.

However, following the successful establishment of the scheme, the Provincial Council has made a commitment to work more closely with the grama niladaris (government representatives at the village level) to ensure that systems become available to the poor, as well as those that can afford to repay the loans. There are also plans to extend the project to the homes of workers in the tea estates.

Conclusions

- Uva Province took a substantial risk in diverting traditional grid extension funds to invest in a relatively new technology such as solar PV, and had to work hard to convince the relevant ministries to re-allocate funds accordingly.
- Electrification is often highly political, since the promise of it is used to attract votes. This makes it more difficult to obtain support for decentralised solar PV from politicians.

- The participation of the Provincial Council in this project appears to be the main success factor. It has played a key role in:
- Establishing the criteria for selecting clients, so that a uniform system could be followed.
- Monitoring the project and providing end users with an avenue for airing their grievances, thus improving the quality of service by the vendors.

Though a successful scheme, many users believe that the electricity needs of the community are not adequately met by solar home systems. However, until extension of the grid becomes a realistic option, they see this as the only way that they will obtain an electricity supply

Part V: UGANDA

by

Konserve Consult Ltd

Contents: Part V Uganda

INTRODUCTION

Exploring ways of improving access to electricity is essential for poverty reduction. The emergence of service delivery through public-private partnerships meets growing concern that only the wealthiest members of communities will benefit from expanded electricity services. The main objective of the PACE project[22] has been to review existing public-private partnerships in small-scale electrification projects in four countries, and develop an understanding of what is required to ensure that community-based electrification is both sustainable and able to deliver livelihood benefits to all social sectors.

Focusing on Uganda, this document is one of four sets of National Guidelines that represent the key outputs of the PACE project. Other guidelines have been produced for Ethiopia, Nepal and Sri Lanka and the lessons from all four countries have been compiled into an International Guide, which is aimed at international stakeholders actively involved in community electrification and poverty reduction programmes or projects.

Within the context of electricity sector reform, and existing electrification programmes, this document has been designed to highlight the key issues that are emerging from the energy sector reform and community electrification processes in Uganda, based on recent experience. The recommendations apply to public and private actors at the national, local and community level.

In summary, the guide covers:

- Progress towards electrification in Uganda and electricity sector reforms.
- Overview of current rural electrification activities; the Electricity for Rural Transformation (ERT) program.
- Recent lessons.
- Guidelines and tools that will help ensure wide access at key stages of electrification projects.
- Recommendations for removal of remaining barriers to decentralised electrification.

STATUS OF ELECTRIFICATION AND ELECTRICITY SECTOR REFORM

Uganda has implemented major reforms in the electricity sector since passing the Electricity Act in 1999. The new law removed the monopoly of the Uganda Electricity Board (UEB) in the generation, transmission and distribution of power and introduced private sector participation in the electricity sector. It also established the Electricity Regulatory Authority (ERA) which is charged with licensing private electricity producers, and regulating the electricity sector. These reforms have created a radically different electricity environment compared to many other countries at a similar level of economic development.

Only 5% of Ugandans have access to electricity, of which only 1% is found in rural areas. Most energy needs are currently met through biomass and kerosene.

Until the enactment of The Electricity Act in 1999, UEB was the only institution in Uganda that could legally initiate and implement electrification projects, mostly through extension of the national grid. However, exorbitant costs and the difficulty of securing funds from donors constrained efforts to take electricity to the large majority of Ugandans living in rural and peri-urban areas.

In 2001, the Ugandan government produced the 10-year Rural Electrification Strategy and Plan (RESP) which would act as the main guide to Uganda's electrification process, and sets a rural electrification target of 10% by 2010, a ten-fold increase on the current level.

[22] The PACE project has been funded by the UK Department for International Development (DFID).

Population	*24.6 million*
Physical Area	*241,000km^2*
GNP Per Capita	*$320 per annum*
Urban/Rural Population Mix	*15% urban/85% rural*
Electrification of households (%)	*5%*
Power Generation (installed capacity)	*300MW*
Literacy rate	*67%*
Annual Rainfall	*700 – 1400mm*

Table 18: Country Statistics

Liberalisation of the electricity sector in Uganda has occurred through the following:

- Licensing of Independent Power Producers (IPPs)
- Privatisation of the generation, transmission and distribution functions of UEB

Only the grid generation function has so far been privatised, after being sold on a concession basis to the South African electricity company, Eskom, in 2002. The government is now in the process of privatising the transmission and distribution functions of UEB. Following the electricity sector reforms, the government has set up institutions such as the Rural Electrification Agency (RE-Agency) to initiate and facilitate investments in off-grid electrification projects by linking project developers to potential sources of funding.

With these relatively new and transparent measures in place, there are hopes for significant private sector engagement in Uganda over the coming years, leading to accelerated rural development and poverty alleviation.

PUBLIC PRIVATE PARTNERSHIPS AND ELECTRIFICATION

OVERVIEW

After successfully implementing reforms in the energy sector, the Uganda government developed a policy to encourage the creation of partnerships for investing in electricity generation projects by government, private organisations, non-governmental organisations and the church. The government developed the Rural Electrification Strategy and Plan (RESP) in 2001 which set a 10% rural electrification target by 2010 as part of its efforts to reduce poverty in rural areas.

According to the RESP, Uganda's rural electrification process would be private sector led under the Energy for Rural Transformation (ERT) program, which is being financed by the World Bank along with other donors including the Norwegian Agency for Development Co-operation (NORAD), the Swedish International Development Agency (SIDA), and the Japanese International Cooperation Agency (JICA).

The ERT project was preceded by the Africa Rural and Renewable Energy Initiatives (AFFREI) project which paved the way for private sector led rural electrification by specifically focusing on the promotion of renewable energy technologies in rural electrification, improving utilisation of traditional fuels for heating and cooking, and developing innovative financing mechanisms for rural electrification projects.

Uganda's rural electrification experience is quite limited, with previous attempts mostly focusing on the sale of solar systems to individuals and institutions in rural areas. But poor marketing skills by private companies involved in the sale of solar PV, limited awareness among potential consumers, and a lack of technical capacity for design, installation and maintenance have prevented large-scale adoption of solar energy in rural Uganda. Initial costs involved in purchasing solar home systems (SHS) have also

proved too high for most rural Ugandans, the majority of whom are engaged only in subsistence agriculture. The absence of any mechanisms by government to subsidise or reduce import tax on solar equipment has further hampered the adoption of solar energy in Uganda.

1954: Owen Falls Dam constructed, with a generation capacity of 180MW.

1960s: 7.5kVA hydropower plant built to provide electricity to Kisiizi hospital in Kisiizi village, Western Uganda

1980s: Kisiizi hydropower plant expanded with the assistance of a UK NGO called Tear Fund, and generation capacity jumps to 60kW. Plans are underway, in 2003, to further expand the hydropower plant to about 300kW.

1995: Private Sector Foundation Unit established forming a joint effort of private sector business associations to collectively interface with Government and Development partners to guide economic growth of Uganda. PSFU became implementing agency for $12.4m credit provided to the Government of Uganda by the World Bank/IDA. BUDS-ERT subsequently established to support preparation of Energy for Rural Transformation (ERT) projects

1997: Implementation of the Owen Falls Dam Extension project begins with the aim of increasing electricity generation capacity to 300MW.

1998: Implementation of the Uganda Photovoltaic Pilot Project for Rural Electrification (UPPPRE) begins. The project was intended to sell solar PV to 2000 households and institutions in rural areas, and was initially aimed to end in 2001.

1999: Magale Hospital in Mbale acquires a 37kVA generator set with the assistance of a catholic organisation called the Mill Hill Fathers, and decides to sell the excess capacity to the local community. About 60 consumers were connected, but the project collapsed after one year due to operational difficulties.[23]

2000: Electricity Regulatory Authority (ERA) Established (under the Electricity Act of 1999)

2001: Government, together with The World Bank, developed the Energy for Rural Transformation (ERT) program, to provide the main framework for implementing community electrification projects. Support provided donors including SIDA, JICA and NORAD. Projects that have so far benefited from the ERT include the Kisiizi hydropower project and the West Nile electrification project. Smart subsidies introduced under ERT for solar home systems.

2003: First Rural Electrification Project licensed by ERA: West Nile Hydro project, Northern Uganda (6MW), with Clean Development Mechanism (CDM) financing by Prototype Carbon Fund

Table 19: Chronology of electrification developments in Uganda

The Uganda Photovoltaic Pilot Project for Rural Electrification (UPPPRE), a three-year program that started in 1998 with funding from the Global Environment Facility (GEF) and the United Nations Development Program (UNDP) has so far been the government's most extensive programme for promoting solar energy in rural Uganda. The main purpose of this project was to establish viable financial and institutional mechanisms for the commercial dissemination of solar technologies to rural households and institutions. UPPPRE targeted women entrepreneurs by offering credit through a women's bank to enable them acquire solar systems. However, high interest rates, short repayment schedules and collateral requirements hampered the success of the project[24]. Reports indicate that UPPPRE resulted in the sale of 576 solar home systems and 11 institutional systems. Given the fact that the project's initial target was 2000 SHS, this is an indication of the limited success of the project.

[23] See Annex A for Uganda case study of the PACE project
[24] UNDP, 2001

Solar dominated the renewable energy scene in the past, with small scale private companies complementing government efforts in the dissemination of solar PV systems but there was limited success in the sale of solar technologies due to high purchase costs and poor installation and maintenance skills.

Project development in other technologies, including diesel generation, biomass, wind and micro-hydro schemes have been very limited.

In a nutshell, rural electrification programmes in Uganda have mostly lacked coordination, with donors financing individual small projects targeting very small communities and having relatively little overall sustained impact on the energy situation in the country.

ENERGY FOR RURAL TRANSFORMATION (ERT) PROGRAMME

The Energy for Rural Transformation (ERT) programme was developed by the government, together with the World Bank, to provide a framework for initiating and implementing community electricity projects. The programme has already received massive support from other donors, and has established funding mechanisms for project developers. The ERT is expected to facilitate investments in energy and ICT projects by the private sector. The ERT program will help to develop potential by the private sector to invest in electrification projects by giving financial assistance for business development activities such as conducting feasibility studies and marketing of renewable energy technologies.

Donors have given $375m to the ERT, with the Private Sector Foundation Uganda (PSFU) in charge of project preparation under its BUDS-ERT program and the Rural Energy Agency (REA) responsible for managing subsidies under the Rural Electrification Fund (REF). A summary of the roles of the REA and description of the REF are given in Annex C.

Project preparation is clearly a key stage in priming the ERT pipeline of projects. Details of the BUDS-ERT program, which has a major role to play in stimulating and supporting project preparation, are given below.

BUDS-ERT

Objectives

The main objective of BUDS-ERT is to develop private sector capacity in starting, operating and improving rural electrification related businesses and to increase their application of efficient productive uses of electricity and traditional fuels in rural areas. It provides financial assistance and advisory services to organisations working in the energy and ICT sectors, particularly those involved in the promotion solar PV technologies.

BUDS-ERT provides cost-share grants to firms to carry out pre-approved activities in business planning and capacity building of energy and ICT businesses. However, the grants can only be given after the developer has concluded such activities which means that the program only reimburses already spent funds.
An enterprise that qualifies for subsidies can receive up to US$50,000 in cumulative cost share grants over the four-year period of the first phase of the ERT project. The program also gives sales-based performance grants to organisations which market, sell or provide on a leasing or service basis, P V products that meet minimum quality standards developed by the Uganda National Bureau of Standards (UNBS).

Eligible Beneficiaries

The target beneficiaries of BUDS-ERT include entrepreneurs, micro, small and medium enterprises, finance organisations, non-governmental organisations (NGOs), community-based organisations (CBOs) and other private entities. The program mainly engages private sector organisations in order to address the skill and information barriers that constrain their response to rural electrification business opportunities.

Relevant Potential Business Areas for Eligible Beneficiaries in Electricity

- Independent Grids: Several potential sites have been investigated and are to be ranked for development, including a range of hydro projects.
- Solar Photovoltaic sources: Solar Energy applications: Solar photovoltaic home and institutional systems, water heating, cooling and crop drying, lighting, telecommunications, vaccine and blood refrigeration, radio and television.
- Co-generation technology: For example, the use of bagasse from the sugar industry used to produce heat energy, steam and electricity for own use or for sale to the national grid or other operator.

Financing

Financial institutions may, on approval by the Bank of Uganda, participate in the ERT refinance scheme implemented by the Central Bank to finance energy and ICT businesses. BUDS-ERT support includes technical assistance to the financial sector to develop new financial products that are suitable for investments in the energy and ICT sectors.

Business Planning and Capacity Building

A typical sequence of steps that leads to the approval of grant support includes the following:

- Submission of application
- Vetting, followed by approval or rejection of application
- Preparation and signature of support agreement
- Implementation and monitoring of activity
- Completion of activity and submission of claim for re-imbursement
- Verification of deliverables; verification of accountability documents; and reimbursement of 50% of the agreed costs to the applicant.

It is too early for assessments to be made about the costs and benefits of this approach to project development in Uganda. In the coming years, implementation of the ERT program will provide valuable lessons for future community electrification projects both in Uganda and internationally, and could become a strong foundation for a robust rural electrification sector in the future.

The following section specifically discusses lessons that have derived from the limited rural electrification efforts that have taken place in Uganda in recent years, most of which effectively pre-date the ERT programme. These are useful because they highlight sustainability and poverty alleviation issues at the centre of distributed rural projects in Uganda and have implications for the ERT programme itself. The section begins with a brief description of the three case study surveys that were carried out under the PACE project.

RECENT LESSONS

Within the PACE project it has been possible to analyse the impacts of some community electrification projects that have been implemented through public-private partnerships. Detailed case studies[25] were carried out in three communities to explore the following community electrification projects:

Case Study 1: Mini-grid from a 37kVA diesel generator in Magale village, Eastern Uganda, established through collaboration between Magale hospital and the Magale community. The generator was provided by a catholic organisation, the Mill Hill Fathers, and installation of the grid was by a local technician.

[25] Full versions of the case studies are available in Annex A

Case Study 2: A 60kW micro hydropower project in Kisiizi village, western Uganda, built during the 1960s to provide electricity to Kisiizi hospital. A new organisation, the Kisiizi Power Company (KPC), was recently created to spearhead plans for expanding the plant's electricity generation capacity to about 300kW. KPC is jointly owned by the community and the hospital, and is to receive funding from the ERT program as well as the Global Environment Facility (GEF).

Case Study 3: Battery charging project in Bufumira sub-county, central Uganda designed to benefit at least 200 households through construction of a battery charging facility using solar and wind energy. The project received grant funding support from UNDP/GEF, and was pioneered and implemented by the Bufumira Island Development Association (BIDA) whose membership mostly constitutes area residents.

The case studies focused on:

- Project implementation processes: Initiation, finance, structure, levels of stakeholder involvement, tariff arrangements, management, maintenance and general sustainability.
- Livelihood impacts: Analysis of both direct and indirect access to electricity in the domestic, commercial and institutional sectors.

PROJECT IMPLEMENTATION

The following were the lessons learnt from the case study work, specifically for project implementation issues:

- The community should be involved in planning and implementing the project in order to increase acceptance of the project by community members and to ensure that the project is successful and financially sustainable (see Box 17).

> ***Community involvement in the Magale electrification project would have boosted consumer confidence in the project***
>
> *The community In Magale was not involved in planning the electrification project. As a result, they refused to own the project and were unwilling to contribute towards the implementation process even though they were supposed to be the ultimate beneficiaries. Later, they were unwilling to pay higher electricity tariffs when it became necessary to increase tariffs in order to cater for the increases in fuel consumption by the generator. This eventually forced the hospital to withdraw the service, and in the process lost a lot of money to the defaulters who had already got disconnected due to non-payment of dues.*

Box 17: Community involvement

- In the absence of a private sector operator, operations and maintenance can be undertaken by community members, in order to keep operational costs at a minimum and to generate income for those who become skilled in installing and repairing equipment. Training and technical support is, however, of crucial importance to sustainability in this regard.
- Mobilisation by local leaders, especially at local council levels (called LC I and LC II in Uganda, eg parish) is necessary, especially in changing local attitudes and perceptions regarding payment of electricity tariffs and making financial contributions towards acquisition or maintenance of equipment.
- It is important to carry out a full and complete technical study on the project (for example the renewable energy resource) before committing resources in order to avoid wastages (see Box 18).

> ***Research and wide consultations before project implementation can save resources***
>
> *Despite enjoying huge community and donor support, the Battery Charging Project on the Bufumira Islands was eventually unsuccessful after project implementers realised that the wind speed could not generate adequate levels of electricity for powering the battery charging equipment. The project was designed to use solar and wind energy for charge consumers' batteries and save them having to travel to the mainland for this service. Project implementers had taken it for granted that the strong Lake Victoria winds would be sufficient to power the equipment but this proved not to be the case. For the time being the project had to rely on solar energy.*

Box 18: Information gathering

- It is necessary to conduct a public awareness campaign that encourages local people to support and invest in electricity generation projects. The campaign would also address issues of power thefts and payment defaults by consumers.
- Partnerships between the public sector and private organisations are important. Positive and wide engagement can reduce the barriers to increasing access to electricity by poor people by enhancing funding opportunities and facilitating co-operation with community members (see Box 19).

> ***Strong public private partnerships can enhance project success***
>
> *The Kisiizi Power Company, which is a partnership between the local community, the hospital, government and donors has attracted much interest and support from the different stakeholders, and is likely to be one of the first companies to receive a subsidy from the BUDS-ERT program. The company aims to upgrade the current 60KW capacity hydropower plant to 300KW so that there is enough electricity to supply the Kisiizi Hospital and the village community.*

Box 19: Public-private partnerships linked to success

LIVELIHOOD IMPACTS

Uganda's experience of rural electrification projects is quite limited, with most electrification projects focusing on grid extension to urban and peri-urban areas. It is therefore still uncertain what livelihood impacts the Energy for Rural Transformation (ERT) programme will have on the poor people in rural Uganda, although evidence from the three case study surveys carried out under the PACE project (see

Annex A) shows that increased access to electricity by poor people greatly improves their livelihoods, and enhances their productive potential.

The following lessons for livelihoods impacts have been drawn from successful grid extension projects to peri-urban areas and the three PACE case study surveys:

- Electrification can attract professionals and business people to rural areas which can enhance trade growth of both agricultural and non-agricultural items (see Box 20). This, in turn, can boost local livelihoods through increased incomes. While recognising that it may not always be feasible to connect every household at the outset, this means that non-connected households can still benefit through employment opportunities and improved local services. This will improve their ability to pay for electricity in the future.
- Livelihoods can be improved and vulnerability reduced when poor people have increased access to different types of capital, such as education, skills, land and other physical and non-physical resources. One way this can be achieved is by training the poor in technical matters such as installation and maintenance of systems.
- Security is a non-physical asset that electrification can improve access to, through the introduction or improvement to street-lighting. Although this service is of benefit to the whole community, it is especially the case for women and children.
- Expanding access to ICT as part of the electrification program can further improve livelihoods as it widens the knowledge base of poor people.

Absentee landlords and professionals returned and settled in Magale Village after electrification

When Magale village became electrified in 1999, absentee landlords returned and built more houses for professional teachers and health workers who were attracted to jobs in the village schools and hospital because of the availability of electricity. Poor subsistence farmers benefited from the influx to the village of richer people who bought their food crops. Electrification opened up new markets for the farmers in Magale and facilitated diversification of income-generating opportunities for those who were able to branch into petty trade activities. Farmers who could not afford to have electricity in their homes were at least able to increase their incomes, and could more easily access health and education services especially for their children.

After acquiring the 37KVA generator, Magale Hospital introduced health-based video programs which focused on sanitation, HIV/AIDS and hygiene. In rural areas such as Nakaseke in central Uganda which have been reached by the electricity grid, telecommunication centres have been built and poor people are able to gather and listen to news or interact with other communities in Uganda and around the globe.

Box 20: Electrification opens up opportunities

THE WAY FORWARD

CURRENT OPPORTUNITIES, CHALLENGES AND CONSTRAINTS FOR COMMUNITY ELECTRICITY SCHEMES IN UGANDA

Opportunities

The Energy for Rural Transformation (ERT) program described earlier in this report provides Uganda with the best opportunity for investing in community electricity schemes because of the subsidies that it extends to the private sector through the BUDS-ERT project preparation scheme and the Rural Electrification Fund, and the prospect for creating partnerships to implement electricity projects. The ERT is a private-sector led rural electrification program which has already received $375m, and gives subsidies of up to $50,000 to private and community organizations interested in carrying out business

planning activities such as feasibility studies and environmental impact assessments (EIAs) for electricity generation.

Uganda also has a strong legal framework for licensing and regulating private electricity generation projects. The 1999 Electricity Act established the Electricity Regulatory Authority (ERA) which is charged with licensing new projects and regulating the electricity sector. The law also established the Rural Electrification Agency (RE-Agency) which is charged with initiating electrification projects in conjunction with local authorities, private companies, non-governmental organizations and community-based organizations.

Uganda has a very high hydropower potential estimated at over 2000MW. Currently, just about 300MW is being generated by the Naluubale and Kiira Dams. Several sites for small scale hydro generation have already been identified, and predominantly in the western part of the country as the table below indicates:

SITE	*REGION*	*EST. CAPACITY (MW)*	*STATUS*
Mobuku 2	*Western*	*11.1*	*Pre-feasibility studies complete*
Muzizi	*Western*	*4-10*	*Estimate*
Paidha	*Northwestern*	*5.1*	*Feasibility study complete*
Rwizi	*Western*	*0.5*	*Pre-investment studies complete*
Nsongezi	*Western*	*2.0*	*Estimate*
Kakaka	*Western*	*3.0*	*Estimate*
Nyamabuye	*Southwestern*	*2.2*	*Pre-investment studies complete*
Siti	*Eastern*	*1.0*	*Feasibility studies to start soon*
Sipi	*Eastern*	*5.4*	*Pre-investment studies complete*
Anyau/Olewa	*Northwestern*	*1.5*	*Feasibility studies complete*
Haisesero	*Southwestern*	*1.0*	*Estimate*
Mvepi	*Northwestern*	*2.4*	*Estimate*
Ala	*Northwestern*	*1.5*	*Estimate*
Nkussi	*Western*	*0.9*	*Estimate*
Mitano	*Southwestern*	*2.0*	*Estimate*
Sezzibwa	*Central*	*0.5*	*Estimate*
Soghai	*Western*	*2.0*	*Estimate*
Ishasha	*Southwestern*	*4.0*	*Feasibility studies complete*
Buseruka	*Western*	*15.3*	*Pre-feasibility studies complete*
Nengo Bridge	*Southwestern*	*7.7*	*Pre-feasibility studies complete*

Table 20: Potential sites for hydropower generation in Uganda

In most cases, the structuring of these projects, and particularly the involvement of local government and communities, has yet to have been agreed.

There are numerous opportunities for expanding Uganda's solar energy market which is still relatively underdeveloped. However, utilization of microfinance institutions (MFI) for resource mobilization would enhance the success of such programs given the high upfront costs for purchasing solar technologies and the need for training in the installation and maintenance of the systems. In any case, solar energy appears to be the best option for sparsely populated areas which may be some distance from alternative grid or mini-grid solutions.

With the electricity sector now fully liberalized, the prospects for private-sector involvement in the generation, transmission and distribution of electricity are now looking much better. Apart from bringing in new funding for electricity projects, private companies can share with government the risks involved implementing electrification projects.

Challenges and Constraints

Uganda, however, still faces the challenge of securing adequate financing for electricity projects, especially from the local commercial banks which are still reluctant to extend loans without first receiving full collateral from potential project developers. Despite receiving strong support from donors, the Rural Electrification Fund (REF) cannot solely support the electrification process. At the same time, convincing local people to contribute money to community electricity projects will be a major challenge because it is often perceived as government's responsibility, and they may be unwilling to part with their small incomes for the sake of obtaining electricity.

The ERT process is still new and untested which is a major challenge for the Uganda government as there are no precedents of successes in implementing distributed electrification projects.

Uganda also faces the challenge of ensuring that the large majority of poor people in rural areas have access to the benefits of electrification as most of them are subsistence farmers and may not afford to have electricity in their homes, or even contribute to the cost of public services. Electrification brings key services such as health, education and water closer to the people, and ensuring that poor people within electrified communities have access to such services will be a major challenge for the Uganda government.

Effective involvement of local authorities in planning, designing and implementing projects is crucial to achieving wider access and livelihoods improvements for poor people. Although decentralisation of government activities was implemented as far back as 1997, programmes in the energy sector have been co-ordinated from the central office. As a result, most local authorities are unaware of the kind of roles they could play in initiating and implementing community electricity projects.

Poverty levels in rural areas in Uganda are very high, and this could prevent most people from accessing electricity. Moreover, most tariffs for off-grid electricity projects are traditionally higher than tariffs for grid electricity. Lack of affordability could therefore hinder access to electricity by poor people in Uganda.

The ERT program could be affected if developers consistently fail to secure equity for their electrification projects. Gaining the confidence of local commercial banks will therefore be crucial to the successful implementation of community electricity projects.

OVERCOMING REMAINING BARRIERS TO ACCELERATED OFF-GRID COMMUNITY ELECTRICITY

Uganda lacks experience in rural electrification and, despite having in place a strong legal and institutional framework to facilitate the process, much work needs to be done to overcome the remaining barriers, such as inadequate information on the available investment opportunities under the ERT, unwillingness by local communities to participate in electrification projects and the small number of institutions in rural areas that could provide anchor consumption and ensure long term financial sustainability of the projects.

- Creation of strong public private partnerships between the various different groups will be crucial to overcoming existing barriers to off-grid community electricity projects in

Uganda, as it involves sharing the risks and benefits of electrification and provides a win-win situation for both the consumers and service providers.

- A significant and carefully targeted awareness creation campaign aimed at district authorities, local and international private organisations, NGOs and CBOs will be necessary to encourage them to invest in electricity projects together with the local communities. Some of the uncertainties that could be addressed in the awareness campaign include the following:
  - How best to attract and develop local interest in opportunities offered by the ERT programme?
  - How can interested project developers apply for subsidies?
  - What criteria are followed when approving subsidies?
  - What roles do different institutions play in the rural electrification process?
  - How can the local authorities get involved?
  - What are the potential benefits of electrification?
  - What is the process for implementing electrification projects?
  - How can project developers secure equity for their projects either from local commercial lenders or from international institutions?
- Without examples of successful community electricity projects, it will not be easy to overcome the persistent reluctance among local commercial lenders to finance rural electrification projects. To overcome this barrier, government will have to continue to be heavily involved in initiating, planning, implementing and monitoring electricity projects. The role of the Rural Electrification Agency (REA) in helping project developers to secure funds for electrification projects is central to the success of the ERT program.
- Getting key sectors such as the agriculture, health and education to embrace the ERT program is likely to increase electricity consumption in rural areas, especially if more schools and hospitals are built. At the same time, existing schools and hospitals could be at the forefront of mobilising communities to implement electricity projects in their localities. Construction of agro-processing industries in areas growing cash crops such as coffee, tea, vanilla and cotton would also increase electricity consumption in rural areas and thus ensure the long term financial sustainability of community electricity projects.
- As a result of risk associated with rural projects and the high cost of private finance, the difficulty of attracting international private companies to invest in generation, transmission and distribution of electricity in Uganda may eventually limit the level of access to electricity by poor people in rural areas. Large-scale investments would help reduce the high marginal costs of electrification and the subsequent high tariffs which are associated with small-scale investments, but (like the national grid) these clearly cannot serve smaller, remote communities.
- There is a need to further develop the possibility of using microfinance institutions (MFIs) to mobilise finances and extend credit to potential beneficiaries of electricity projects especially those involving solar energy which requires payment of high upfront costs. High poverty levels in rural areas coupled with the high tariffs charged by off-grid electrification projects will most likely limit the positive impacts of electrification on livelihoods.

STEPS AND PROCEDURES

The procedures applicable for preparing and implementing rural electricity projects in Uganda are well defined by the various agencies involved. These include the regulator (ERA), the Rural Electrification Agency (ERA), the Business Development Support Unit of the ERT (BUDS-ERT) and the various other entities in the central public sector in Uganda. Some of the issues have been explored elsewhere in this report, but it is not necessary to fully reproduce the relatively clear procedures in this document.

These have been described and defined in various statutory and guidance instruments, together forming a very clear description of what can and cannot be done, and what financial and technical support is available.

In the following section, we will indicate areas where the existing frameworks for promotion of rural electrification could be enhanced, or where further consideration could be given to improve sustainability and poverty alleviation aspects.

RECOMMENDATIONS

Uganda has quite limited experience in rural electrification and community electricity projects. Most of the projects that have been conducted until the late 1990s have happened in a relatively unstructured regulatory environment. Projects and programmes that have been developed suffered from this lack of support both at a central and local level.

Livelihood benefits that have accrued through such activities have often been lost due to poor design and financial structure of projects. Critical partnering aspects, such as full engagement of actors, from the community right through to national government agents have simply not happened, leading ultimately to stagnation or failure of projects.

However, more recently, with the passing of the Electricity Act of 1999, there has been rapid reform of the electricity sector. There are now positive, transparent and enabling frameworks in place. The Energy for Rural Transformation (ERT) programme has a particularly private sector orientation, and as an implicit measure of sustainability, leans heavily on the ability of projects to attract commercial finance.

There are a number of issues that are worth considering in order to enhance the prospects of rolling out rural electrification in Uganda, and these are summarised below.

- **The Government of Uganda, and particularly the REA needs to address the need for communications to local communities and government, in order to achieve the required local understanding and support for small rural electricity schemes**. Due to the nature of many rural electricity projects, such as micro-hydro mini-grids and solar home systems, projects cannot even be conceived without local knowledge and support. For this to be properly addressed, communication of the nature of opportunities, the costs and the benefits must be clearly understood by the full range of stakeholders. This issue is already understood by the GoU, but activities in this area must be accelerated if the ambitious targets for rural electrification are to be met.
- **An option for addressing local development options at source is the concept of local resource planning. This involves supporting local government in identifying, prioritising and supporting the implementation of local projects in the widest sense**. First of all, development opportunities and priorities are explored including farming, health, industry and commerce within the context of local natural resource opportunities. With this holistic and broad based approach to development, and with appropriate consultation of local communities and business, plans for local development can be drafted. Integral to these plans is the extent to which energy and electricity may be important and how that component of development can be integrated. All activities

require energy to a greater or lesser extent, whether water for irrigation, electricity for clinics, or energy for powering business. The links to the ERT and other government programmes must be integrated so that local government can take maximum advantage and meet local development needs. This process requires a level of capacity that is often not found in local government, so support and capacity building measures are required.

- As in most countries, finance is a particularly crucial aspect in Uganda. The ERT provides significant incentives for rural electrification projects and is considered internationally to be an ambitious and innovative programme. Despite the incentives offered, there is a significant dependency on the private sector and communities to take a stake and commensurate risk in developing projects. Mobilising private finance is particularly important but challenging, as the local finance sector is completely unfamiliar with the energy sector. Rural investment of any kind is high risk and the mechanisms offered by the ERT go a long way in mitigating risks. However, strong linkages and positive engagement is necessary to guarantee the viability and sustainability of new projects.

Annex A - PACE Project Case Studies

Case Study 1: Micro Hydro System, Kisiizi, Uganda

Background

With time, load shedding became the order of the day. A UK-based company, Econnect, was contracted to install a load management system which automatically disconnects a user when overloaded. This helps prevent the hydropower plant from breaking down. The hospital management also advised against the use of heavy electric items such as cookers and kettles. The rest of the community in Kisiizi does not have electricity, as the original supplies were designed for the hospital, which serves the entire community. This will change with the planned expansion of the micro hydropower plant with the Uganda Energy for Rural Transformation (ERT) technical and financial support. The expansion will increase capacity to nearly 300 kW through the establishment of Kisiizi Power Company (KPC), a joint venture of the Hospital and the Diocese. KPC will build, own and operate (BOO) the entire system, and eventually sell to some 800 customers outside the Hospital in the area. The new investment will enable the hospital to meet its increasing electricity demand, and help the rest of the surrounding community to accelerate development.

Figure 23: A ward in the Kisiizi hospital (Photo from Kisiizi hospital website)

Financing

Financing for the construction of the micro hydropower plant in the 1980s was by a UK-based NGO, Tear Fund. But the planned expansion of the hydropower plant will be financed by multiple partners including commercial banks, the hospital itself, the community and donors. The hospital plans to take advantage of the World Bank funded ERT program which is a private sector-led project supported by the Uganda Government and donors.

Public-Private Partnerships

While the initial successful electrification of Kisiizi Hospital involved only a few players, the planned expansion of the plant will see the involvement of numerous partners including the Uganda Government through the Ministry of Energy and Mineral Development (MEMD), multilateral organizations including the World Bank and the Global Environment Facility (GEF), the local community, at least one commercial bank, and the private sector through the Kisiizi Power Company.

The table below is a brief summary of the partners that are involved in the project to expand the Kisiizi hydroelectric plant and the sectors they represent.

PARTNER/ACTOR	SECTOR
Ministry of Energy & Mineral Development	*Public sector*
The World Bank	*Donor*
Global Environment Facility	*Donor*
Kisiizi Power Company	*Private sector*
Commercial Banks	*Private sector*
Kisiizi residents	*Community*

Table 21: Partners in the Kisiizi hydropower plant expansion project

Access to Electricity

Livelihood benefits – Direct Consumers

The livelihood benefits of electrification to the Kisiizi community have mainly been through the marked improvement in the services that the hospital offers. Uncharacteristic of most rural hospitals, Kisiizi offers a diversity of services to the community including immunisation, maternity, surgery, dentistry, HIV/AIDS prevention and treatment, and psychiatric services. Kisiizi Hospital has one of the developing world's most innovative rural health insurance schemes with over 9,000 rural Ugandan members covered by the scheme. It also implements a Community Based Health Care (CBHC) program which is funded by Tear Fund, as well as X-ray and eye-treatment services.

Example of benefits: *In addition to lighting for wards and homes, electricity allows the use of medical and surgical equipment and autoclaves.*

There is also a primary school that is run by the hospital, Kisiizi Hospital Primary School, which has 11 teachers and 238 pupils, most of them from the surrounding community (non-Hospital). According to the Medical Superintendent in his 2001/2002 end of year report, the school is an important part of the community partly because it is one of the reasons the hospital has been able to attract high quality staff, but mostly because it gives young people a chance at getting education. A crafts centre which was recently built will also help to impart practical skills to the youth.

Commercial use

So far there is no commercial use of the electricity from the hydropower plant since it was built to specifically meet the needs of the hospital. Apart from the medical functions, the hospital also uses the electricity to operate a maize grinding mill, a welding garage, a carpentry shop, electric water heaters and security lighting. The mill, garage, and carpentry shop specifically serve the hospital and are not for commercial use. It is estimated that after the hydropower plant is expanded, it will supply electricity to at least 194 commercial users, most of them small businesses engaging in petty trade of agricultural products. The table below shows the estimated number of customers and the level of demand for expanded Kisiizi Hydropower Plant (KHPP).

CUSTOMER CATEGORY	NUMBER
Households	*400*
Small businesses	*194*
Light industry	*14*
Institutions	*10*
Total customers	*618*

Table 22: Estimated number of customers for the KHPP by 2005

Increasing the capacity of the hydropower plant from 60kW to 294kW will enhance the development of Kisiizi and improve delivery of social services in the village and the surrounding areas.

Conclusion

The following are important issues to look out for:

- Affordability is crucial to increasing access to electricity in Kisiizi.
- Regular supplies will accelerate development of local businesses, especially in milk and grain processing, wood working and welding.
- As one of the first projects to be funded under the ERT, its successful implementation will most likely spark more interest and enhance confidence in Uganda's rural electrification process. The Kisiizi website is at: http://www.kisiizi.supanet.com.

Figure 24: The Kisiizi Hospital complex (photo from Kisiizi Hospital website)

Case Study: Mini-grid from Diesel Genset, Magale Village, Uganda

Background

Magale is a small village of about 6,000 people in Mbale District, Eastern Uganda. It is a remote village located 30km from the national electricity grid. Agriculture is the main activity for the majority of the population, although a few people also engage in petty trade of non-agricultural goods. These form the affluent group in the village.

Population of Magale village	*6,000*
Electrified households in 1999	*61*
Electrified households in 2000	*48*
Minimum tariff (domestic)	*Ush3000 a month*
Maximum tariff (commercial)	*Ush12,000 a month*
Tariff for institutions	*Ush80,000 a month*

Table 23: Details of electrification program in Magale

The electrification of Magale village in 1999 was mainly the initiative of a catholic nun, Sr Emily Nasimolo who was posted as a nurse to the small village hospital. When, in 1982, the hospital expanded its services to include Community Based Health Care (CBHC) among others, patients began flooding in. Night-time operations became necessary, hence the need for better lighting. Sr Emily approached the Mill Hill Fathers, a catholic organisation working in Uganda, who donated a 37.5 kVA generator to the hospital in 1991. However, the hospital was not electrified because Sr Emily was transferred to another hospital just before the generator arrived and it was not until she returned to Magale that electrification of the hospital became possible.

Because the generator's capacity exceeded the needs of the hospital, a decision was taken to sell the excess electricity to the community. However, this situation became unsustainable. Problems began to develop when some members began to use heavy electronics which overloaded the system. This put pressure on the generator and increased fuel consumption from 23 to 25 litres for 3 hours, the duration of which the generator runs daily. Subsequently, tariffs had to be increased and consumers refused to pay, forcing the hospital to halt the electricity sales.

Figure 25: Magale Hospital

Financing

The electrification of Magale village was financed mainly through donations. The Mill Hill Fathers donated the 37.5KVA generator which they ordered from the UK, while the equipment and other accessories for installing the mini-grid were donated by some members of the consumers' committee. Generally, the whole electrification process was marked by voluntarism, and depended a lot on the contribution and interest of personalities rather than institutions.

Public-Private Partnerships

The project was initiated and developed by individuals, mainly Sr Emily, the technician, and members of the consumers committee which comprised local council leaders and the prominent members of Magale village. In the sense that the electrification of Magale village involved a hospital teaming up with community members to install a mini-grid system and sell electricity to those who could afford it, the project demonstrates both public and private sector involvement.

However, the problems that led to the scheme's failure to deliver a sustainable supply of electricity to the community reflect the lack of an effective partnership between the various stakeholders.

Access to Electricity

Livelihood benefits – Direct Consumers

In the first four months of operation of the mini-grid system, 61 consumers were connected. During this time, the community of Magale reaped numerous livelihood benefits. These were mainly in the education and health sectors. The hospital's popularity grew because it was operating more efficiently and competently, and stayed open for longer hours. With the hospital now able to attract more qualified staff, a wider variety of services was made available. The mini-grid essentially made it possible for the hospital to operate the generator by selling off the excess capacity to outsiders.

Example of Benefits: Confidence in Magale Sub-Hospital's competence grew and there was no need for the community to travel long distances to Mbale and Tororo in search of treatment. The hospital was also able to work longer hours, and to undertake surgical operations.

The hospital also introduced health based video resources that it could use to educate the community on sanitation, hygiene and HIV/AIDS.

Considerable benefits were also experienced in the schools, most of which switched to electricity from using kerosene lamps during night classes. It also improved security for pupils, especially on the routes between the dormitories and the classes. The Headmaster of Magale Parents School, Mr Musila, said that academic performance in 1999 improved by about 40% in both the ordinary and advanced exam levels. For this reason, most of the schools acquired their own generator sets after the mini-grid project collapsed in 2000.

Figure 26: The children's ward at Magale hospital

Commercial users

Some commercial users, especially those operating restaurants and bars made huge profits during the period of the mini-grid project. Business in Magale trading centre grew, as did the population and visitors. More food items were brought to be sold in the Magale markets, and these supplied the absentee landlords who had become regular visitors to the town as they hurried to renovate their houses and build new ones. One Magale resident confessed that he made brisk business from his lodge and bar businesses, and earned up to Ush50,000 a week from the bar alone. Property and rental rates in Magale town increased sharply during this period, with monthly rates jumping from Ush20,000 to Ush30,000.

Livelihood benefits – Indirect Consumers

Indirect benefits were mainly manifest through the influx of people keen to use the town's new services, especially at night. The decision by some traders to place bulbs outside their shops and restaurants had the effect of providing street lighting to the community which enabled the public to enjoy a significant level of security. At the same time, households could now have their lead acid batteries charged in Magale town, instead of having to travel to Mbale town, 30km away, which had always been the case. Residents with mobile telephones could also charge their batteries from the trading centre.

Conclusions

The livelihood benefits from the electrification of Magale were, unfortunately, reduced when the project collapsed after only one year of operation. It seems that the failure of this project was a result of the absence of legal and institutional mechanisms for dealing with the problems and misunderstandings that arose among the managers of the project.

A major problem was that many customers were defaulting on payments or conniving with unconnected residents to steal power, leading the project managers to adopt tough prevention methods. This affected innocent customers and increased the bad blood between the customers and the managers. The most important points to note are:

- Failure to involve customers in management of the project gave rise to mistrust and a belief that the tariff increases were unjustified.
- Absence of a strong public-private partnership resulted in reliance on the charisma and good will of a few individuals.
- Only the local leaders and prominent members in the community were involved in the project, and the majority of people excluded. Wider community participation can enhance acceptance and ownership of the project.
- Although direct connections were restricted to those who could afford them, the improvement of local services highlights the potential for indirect livelihood benefits if the scheme had been sustainable.

Annex B - Stakeholder Roles and Responsibilities

Stakeholder	Roles and Responsibilities
Rural Electrification Agency (REA)	*Set up to manage the Rural Electrification Fund (See Annex C).*
Electricity Regulatory Authority (ERA)	*Main government body concerned with electricity regulation. Operates according to Electricity Act, 1999. Approves and regularises tariffs. Authorising body for any electricity projects.*
Ministry of Energy and Mineral Development (MEMD)	*Ministry overseeing energy in Uganda. Responsible for the sector, dealing specifically with energy policy formulation, implementation and monitoring. Under the ERT, overall objective is to ensure that the programme satisfies the objectives of the government's Rural Electrification Strategy and Plan as stipulated in the Electricity Act 1999. (See Annex D)*
Ministry of Local Government (MOLG)	*Central government link with the Local Authorities under decentralisation method of governance opted for by the GoU. Ensure involvement of Local Authorities in developmental activities including rural electrification. Information dissemination during first phase of the ERT (public Awareness) and familiarising Local Authorities about the ERT.*
Business Uganda Development Scheme – Energy for Rural Transformation (BUDS – ERT)	*Under the Uganda Private Sector Foundation (PSF), an operational component of the ERT. Purpose is to develop private sector capacities for starting and operating rural electrification related businesses and for efficient productive uses of electricity and ICTs in ERT areas. Also see Section 3.2*
Ministry of Finance, Planning and Economic Development (MOFP)	*Ministry in charge of government plans, providing funds or ensuring funding for government programs. Government treasury department Under the ERT, handles the Monitoring and Evaluation program to establish a rigorous basis for the impact of the rural transformation approach, identify constraints to the achievement of the stated objectives, and inform and enhance both later phases of ERT in Uganda and similar programs in other African countries.*
Bank of Uganda (B.O.U)	*Central bank of the Government of Uganda. Oversees entire operations in the financial sector. Under Uganda Statutory Act 1993, established the Energy for Rural Transformation Refinance Fund (ERTRF). The ERTRF was set up with a view to* *1. Facilitating investment in pre-specified commercially oriented rural electrification schemes.* *2. Seeking to develop the needed financial intermediation mechanism in which provision of term finance for rural electrification and renewable energy development is part of the normal functioning of the financial sector.*
Uganda Communication Commission (UCC)	*Regulatory agency charged with licensing and monitoring the communications sector. Handles the Rural Communications Development Fund intended for financing universal communication services in areas of communication considered not to be financially viable for the private sector yet need to be catered for. Under the ERT, Lead agency for rural information and communication technologies. To handle the ERT's ICT component whose objective is to facilitate the use of energy in the telecommunications sector, which is considered important in effective social services and development.*

One of the elements of the ERT program is a cross-sectoral approach, under which an explicit effort is being made to ensure that end-user sectors such as health, agriculture, education and water, benefit from the expansion of rural access to energy and ICTs. Access to energy is considered a key ingredient in development. These sectors are considered because of the important roles they play in fulfilling the government's objective of providing adequate services to its populace in a quest of improving the living standards. Relevant stakeholders are given below.

Stakeholder	*Roles and Responsibilities*
Ministry of Agriculture, Animal Production and Fisheries (MAAIF)	*Charged with modernising the Uganda Agricultural Sector through the Plan for Modernisation of Agriculture (PMA) Government Strategy. Handle the ERT-agricultural component which will focus on guidance and promotion of the opportunities for investing in energy and/or ICT agriculture related activities. Develop criteria for accessing the subsidies available for grid extension to private investors in energy access.*
Ministry of Health (MOH)	*In charge of health issues in Uganda. Access to health facilities for all is a government obligation. In the ERT, health component to improve rural health care service delivery, by providing access to energy through the private sector in various categories of Public Health Centres. To ensure health centres are provided with the most appropriate energy solutions to fulfil the energy needs in the most cost effective way.*
Ministry of Education and Sports (MOES)	*Ensure a standard free primary education for all Ugandans through the Universal Primary Education (UPE) programme and expand the opportunities to all. Under the ERT education component the objective is to improve the quality of education in 10 districts by providing access to energy and ICT to post-primary education institutions including staff houses. Also through this MOES, policy guidelines for energy/ICT in post-primary education will be developed.*
Ministry of Water, Lands and Environment/ Directorate OF water Development (MWLE/DWD)	*Tasked with a short-term goal of having sustainable and safe water supply and sanitation facilities within easy reach of 65% of the rural population and 80% of the urban population by the year 2005. Also with goal of having mechanised water piped systems in 251 growth centres (Small Towns) and 78 urban settings. Strategy focused on a decentralised approach, which is community demand responsive and involving the private sector in the service delivery. Pursue the ERT (water component) programme objective of assisting in improving the water supply service by providing the least cost energy solutions to the communities where water schemes have been or are to be installed.*

The other Government Body that is not directly linked with the ERT, but with a very important role to play in attracting investment is the Uganda Investment Authority (UIA). The main Role played by UIA is to promote, facilitate and monitor investment in Uganda; and to provide advisory services to Government on policies which affect investment. The UIA plays the role of licensing projects. A UIA License comes with special incentives depending on the area of investment and may be key for any investment in the Energy sector.

Annex C – The Rural Electrification Agency and Rural Electrification Fund

The Rural Electrification Agency was established as a result of a Statutory Instrument of the Constitution of the Republic of Uganda in the Electricity Act of 1999.

The Minister of Energy was required by this Statutory Instrument to establish the Rural Electrification Fund. The Rural Electrification Agency was set up therefore to manage the Rural Electrification Fund. It was also established as the Operational arm of the Rural Electrification Board (which had been instituted at the End of 2002).

Activities

The activities of the Rural Electrification Agency include:

- Identification and Preparation of Large Electrification projects for Bidding
- Facilitation through funds and technical support of the locally initiated Projects
- Evaluation of Projects for award of Subsidies, which are in turn recommended to the Rural Electrification Board
- To carry out Public Awareness through the print and Electronic media
- To coordinate activities of different stake holders in Rural Electrification; and
- To prepare annual reports on the Progress of the ERT project

Project Realization

The REA realizes Electrification projects by two methods:

- **Competitive Bidding:** This is done through identification of priority Projects and carrying out feasibility studies to tailor the identified project to its most optimum applicability. The project is then packaged into a biddable request for a proposal to interested developers. The bidding process is coordinated by the ERA. Bidding in a project may be for the best tariff offer or for benefiting for a Subsidy from the Rural Electrification Fund (REF)
- **Locally Initiated Ventures**: A concept can be presented to the REA by a project developer for recommendation for funding from the REF. A project concept would first be recommended to the BUDS-ERT program for technical assistance (in terms of funds) in order to develop it into a good and complete project proposal. BUDS-ERT would in this case offer 50% of the funds required to carry out studies and use technical expertise in providing evidence or proof of project feasibility and to further develop the concept. On presentation of the final Proposal, the REA evaluates it and recommends it for award of Subsidy. The ERA would be approached for a license after approval of the Project.

Annex D – The Ministry of Energy and Mineral Development (MEMD)

The MEMD is the line ministry overseeing energy in Uganda. It is responsible for the sector, dealing specifically with energy policy formulation, implementation and monitoring.

The Electricity Act, 1999, provides that the Minister responsible for electricity shall prepare a sustainable and co-ordinated Rural Electrification Strategy and Plan for Uganda for the approval of Cabinet, and once in each year to submit to Parliament a report on progress and achievement of the Plan. All the work done in this area by the MEMD is done in consultation with the Ministry of Finance, Planning and Economic Development, the Ministry of Local Government and other stakeholders in the private and public sector.

As a result, MEMD also plays a key role in the coordination of the ERT project and the development of the sector. In keeping with the power sector reforms which feature a shift in the Government's role from market maker to market enabler, MEMD has adopted a role focusing on strategy, policy, and plan development as well as overall sector monitoring, facilitating other (private sector) actors to take a lead role in physical implementation. Growth of the Ministry into this Role is supported in the ERT project through specialized Technical assistance activities below.

These activities target at promotion of Rural Electrification in areas of Renewable and traditional fuels and monitoring and evaluation of Rural Electrification activities.

- Rural Electrification and ERT promotion with assistance from the MOLG.
- Renewable Energy Resource Information Development and Capacity Building Assessment through the engagement of Specialists.
- Capacity Development and initial implementation of a first set of Renewable Energy Projects.
- Preparation of a Rural Electrification Master Plan with support of an advisory Consulting Organisation (IT power has already been assigned this duty).
- Biomass Gasification and Pilot Activities through implemented Pilot Projects.
- Energy Efficiency Improvements for SMEs with High Usage of Traditional Fuels.
- Coordination, Monitoring and Evaluation of Performance of ERT activities in different Sectors.

Besides the ERT project, the 1995 Constitution of the Republic of Uganda provides the mandate to establish an appropriate energy policy when it states: "The State shall promote and implement energy policies that will ensure that people's basic needs and those of environmental preservation are met". This constitutional requirement makes it incumbent upon Government to formulate an energy policy that will not only sustain the impressive economic growth of the last decade or so but also ensure widespread access to affordable modern energy services for improving the living standards of all the people in Uganda.

As a result of this the Government of Uganda is required through the line Ministry (MEMD) to establish and oversee that all aspects of energy realise the overall goal of the Energy Policy.

The goal of the Policy is "To meet the energy needs of Uganda's population for social and economic development in an environmentally sustainable manner".

Energy Policy Context

The Energy Policy objectives for Uganda have been formulated in the context of the following settings:

- The existing economic, social and environmental policies;
- The nature and linkages of the energy sector with other sectors; and
- International and regional linkages of the sector.
- Details about this policy can be accessed on the Ministry of Energy and Mineral Development website http://www.energyandminerals.go.ug/documents

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