Participative Planning of Off-Grid Electricity Supplies

PART I : PARTICIPATIVE PLANNING AND RURAL ENERGY

1. Introduction

This paper is an account of a piece of work carried out between 1995 and 1999 by Intermediate Technology Consultants, the consultancy arm of the international charity ITDG[1].
The work sought to extend ‘Participation’ techniques (commonly used in development work in agriculture and irrigation) to the planning and management of energy supplies in rural areas. In the initial stages of the work, particular attention was paid to the provision of electricity supplies, but this soon extended to cover the provision of energy services in general.

The use of ‘Participatory’ techniques in the field of energy is new, and this work was therefore primarily a piece of UK-based research. We wanted to know just how far the ‘Participatory’ approach could be developed and how appropriate it might be for a 'high-tech' application such as electrification.
However, the actors involved in the work at village level were engaged primarily in improving their own energy supplies, and the project had, therefore, to deliver outputs to this group as well as the UK research community.

[1] The Intermediate Technology Development Group

2. Rural Energy

It has been estimated that around 50% of the world's population lives in the rural areas of developing countries. While the major cities and most large towns of all countries have some sort of electricity supply, coverage of rural households is much less. It has been estimated that in Africa only around 10% of urban households has an electricity supply and that the proportion of rural households supplied is far less. A survey carried out by the International Centre for Research on the Environment and Development produced the table below [Foley '89].

Table 1 : Proportion of Rural Population with Access to Electricity Supply in Regions of the World

Region	**% Rural Population with Access to Electricity**
Latin America	27%
Asia	19%
North Africa	21%
Rest of Africa	4%

In addition it must be noted that where supply systems do reach rural areas (such as in Zimbabwe), households are often unable to afford the cost of connection. In Zimbabwe, 90% of urban households use electricity, but only around 6% of rural households have a connection [Smith].

Rural populations do not always receive their electricity supply from national grids. Rural areas are often supplied either by local mini-grids or by stand-alone systems, such as small diesel generating sets. Informal settlements in urban areas of developing countries are also unlikely to receive grid electricity.

In rural communities and informal urban settlements, payments for electricity from single consumers are so low that they are not cost-effective for utility to manage. In such situations, SHOs can function as aggregate bodies for low-income households, or can own generation resources and distribution networks.
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** Stuff below from SEI paper**
Specific underlying objectives for launching rural electrification projects vary between projects and countries and also over time. It is evident that economic development, industrialisation and the access to electric power are closely linked. Therefore, in early stages of their rural electrification plans, most governments articulated goals that power supply should be expanded to reach all rural areas of the country. Often, a broad spectra of anticipated benefits from the electrification were listed while the specific mechanisms for achieving it were given less consideration.

A common dilemma for the developing countries is that national electricity utilities have difficulties with generating revenues from there existing services enough to cover any expanded services. Although the pan-territorial development is desireable, core activities in terms of contributors to the GDP, are often prioritised. Commonly, electricity services to large industries, universities, hospitals etc. activities that form the nerv in the countries´ economy, have been heavily subsidised. There is therefore seldom any surplus for investments in new areas.

It is also a widley spread understanding that the mere provision of electricity services seldom leads to anticipated benefits as expressed in the national development plans. The fact that electrification projects often fail to initiate industrial activities or other income bringing uses of electricity result in rural electrification projects commonly not being a lucrative business. It will in most cases take several years before the local electrcity demand has developed to the extent that installed capacity is fully utilised. While awaiting load development, the system will be a finanical burden to its commissioner.

As part of the research cooperation between TANESCO and the Stockholm Environment Institute, SEI, an extensive evaluation of the experiences from the rural electrification program in Tanzania was carried out in 1989 - 1991[2]. The four main conclusions from this evaluation were:

- Electrification is appreciated by the rural people, including those who are not yet connected to the service.

- Rural electrification is a large financial burden on TANESCO. This is particularly pronounced for the isolated diesel supplied areas. In view of this situation, TANESCO will not be able to pursue the rural electrification program sustainably unless either the tariffs are dramatically increased or financial support is provided from the government.

- The quality of the service, in particular the supply reliability, is low in rural areas. This can be explained partly by difficulties with spare parts supply and weaknesses in TANESCO's organisation. The main reason is probably that TANESCO can not afford to maintain a reliable service.

- Many of the perceived benefits of rural electrification which have been used to justify a high economic value, like promotion of small industries and reduced demand for fuel-wood as a cooking fuel have not materialised to a significant degree.

Centralised planning in the own country and a substantial influence from international donors have over the latest three to four decades been the dominating generic features for rural electrification in developing countries. Their relative importance as well as their forms for realisation vary between countries. India for example have always maintained the governmental power over rural electrification plans and accepted aid only under conditions set by the government. In Bolivia, the USAID and through NRECA have had substantial influence on the electricity sector, includig its central planning. The extent to which other initiaves exist varies as well. There are countries were aid activities supporting local initiatives have been fluorishing long before any official, national initiatives were taken as regards rural electrification, both Nepal and Bolivia exemplify this. In some cases the national planning have safeguarded and supported these autonomous initiatives (Nepal), while in other, the national plans have contributed to complicating the local organisations conditions for existing (Bolivia).

International influences on rural electrification activities in developing countries are immense if compared to the rural electrification phase of today industrialised countries. Most rural electrification projects, including them that witnesses a high degree of community involvement, are to a large extent ruled by international policies for development, i.e. beliefs regarding economic and environmental sustainability.

[2] ~~Björn~~ Kjellström Björn et al.~~,~~ 1992~~,~~ ~~,~~ *Rural Electrification in Tanzania. Past Experiences - New Approaches*~~, 1992~~.

An important, and relativaly recent, factor facilitating community invovlement is many developing countries having accepted aid money to be directly addressed to separate community projects rather than always via the central government. Most developing countries tend also to advocate liberalisation and support private investors to act in sectors like power supply. An important driving force for the decentralisation and liberalisation has been the World Bank's Structural Adjustment Program during the 1980's, an policy recommendation that many developing countries assigned to. The structural adjustment aimed at creating market economies in the recipient countries so as to enable a better financial control over investments and activities financed from abroad. While aid was often equivalent to grants during the first decades after the second world war, the present aid structure is one of favourable loans to seemingly financially viable projects.

Environmental aspects on energy supply have grown increasingly important during the era of developing countries' rural electrification. Especially influential has been the global warming theories and the international consensus to mitigate green house gas emissions. An example of how this influences the rural electrification in developing countries is the Global Environment Facility (GEF) that promotes international co-operation and fosters actions to protect the global environment. The grants and funds disbursed subject to GEF complement traditional development assistance by covering the additional costs incurred when a national, regional or global development project also targets global environmental objectives, such as for example green house gas mitigation.[3]

Other mechanisms for the establishment of off-grid power supply systems have in most developing countries existed besides the national electrification programmes. These include christian mission and aid-projects with more specific targets such as vaccination programmes or education programmes, where power supply is one of many conditions for their realisation.

Traditionally, national programmes for rural electrification in developing countries has relied on grid extension or, for remote communities either on diesel generator sets or mini-hydro power, depending on the proximity to a suitable site for a hydro power plant.

The policy of many donors to promote use of renewable energy sources has resulted in a few projects where generator sets are driven by biomass gasifiers and also in several projects where electricity for lighting and operation of water pumps is provided with individual solar panels.
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3. Participative Planning and Management of Rural Electricity Supplies

3.1. Introduction

This section outlines the theories which underlie current work in rural energy provision and makes an attempt to introduce theories of 'Participation ' in development as they are related to the field of energy.

[3] Project Implementation Review of the GEF, 1997. A paper prepared for the GEF Assembly, New Delhi, India April 1-3 1998.

3.1.1. Rural Electrification: Supply Driven Approaches

The governments of most developing countries have electrification programmes which aim to reach rural areas. Rural electrification is an issue upon which local elections are often based, and is often cited as a priority for rural populations, ranking higher than road extension and local provision of health care. In general, national electrification programmes are viewed as a development in national infrastructure, and as such are centrally planned. They often involve high levels of investment, and are based on an increase in generation capacity and the extension of transmission grids. Such programmes are largely supply driven. The generation phase is planned and rural communities are connected as and when the grid reaches them. Demand assessments for such rural electrification programmes are likely to be based upon assessments of community size, linked to national standard consumption configurations. Participative planning approaches are not common.

The cost of electricity produced by conventional power stations compares very favourably with that produced by small decentralised installations. However, if the cost of grid extension to remote areas is included, the unit cost of power delivered to the point of use is on a par with that produced locally for local consumption. Nationally set tariff rates for grid-delivered power often do not reflect the true cost of the units of power delivered. In the rural areas of developing countries, consumers often expect to pay no more for grid electricity than their urban counter parts. This attitude can also affect rural electrification programmes based on decentralised generation, where consumers view electricity as a state-controlled and regulated service, and refuse to accept that the tariff they pay should reflect the true cost of energy production. In the light of this, alternative models for rural electrification have been found to be useful.

3.1.2 Rural electrification: Demand Led Approaches

In many developing countries, national, centrally-planned electrification programmes operate in parallel with entrepreneurial electrification developments. In many remote areas, local business owners offer electric lighting and battery charging based on a variety of small scale generation technologies (predominantly diesel or petrol generators, though increasingly from renewable energy sources). Such schemes are predominantly demand led (i.e. market-led), are completely commercial and receive no subsidy from national level bodies. They do not, however, reach all rural communities. Within a rural community, fractions of the population can also be excluded from electricity services, usually by economic factors.

Programmes which facilitate appropriate changes in policy structures at national level, and institutional capacity strengthening for intermediary bodies (such as rural electrification commissions, rural energy co-ordinating bodies, electrification co-operative associations, Energy Forums) can greatly increase the level of activity in the entrepreneurial energy supply sector, allowing wider access to electricity supplies in rural areas. In particular, policy and strategy changes are required which facilitate the large-scale development of communal schemes with a variety of ownership and management structures.

****Stuff from coops paper below

Cooperatives[4] and self-help organisations (collectively SHOs) are traditionally associated with service provision rather than an entrepreneurial approach to business. While to some extent this is giving way to a situation in which such organisations are aggressively market led, in the area of utility provision, this is generally not the case.

[4] For the purposes of this paper, a cooperative will be defined by the ILO 1966 definition : An association of persons who have voluntarily joined together to achieve a common end through the formation of a democratically controlled organisation, making equitable contributions to the capital required and accepting a fair share of the risks and benefits of the undertaking in which the members actively participate.'

The SHOs involved in utility supply range from simple village irrigation committees to vast electricity supply cooperatives with many thousands of members.

It is impossible to identify the point at which water supply was first managed in a cooperative manner. In the area of electricity supply, it seems likely that cooperative management and control has been practised for some 50 - 60 years.

Communications and Information services can also be supplied using the cooperative model. In the USA , there are 250 telecommunications companies formed on a cooperative framework, and in Peru work is beginning on access to agriculture information databases for rural communities.

The supply of water or electricity is often regarded as a public service rather than an enterprise. It is often, therefore, in public ownership, governed by the community or by the state (depending on its scale).

Beliefs about community vs private ownership are being severely tested by the widespread shift amongst governments and private institutions towards market mechanisms.

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3.2. Participation and Development

Participative approaches to development, originating in the field of agriculture and natural resource management, have extended this idea to incorporate participation into the design of the consultation process, the process of consultation itself, the analysis and assessment phase, and into resulting project design, implementation and management. This section reviews participative approaches and their application in the field of rural electrification. The next section describes the experience of actually applying these ideas in the field.

3.2.1 Introduction to Participation

Since the 1970s, there has been a growing awareness, world-wide, that conventional development approaches have failed to deliver results which meet the needs of resource-poor people.
This is because conventional approaches often:

- take too long,
- generate too much information,
- have fixed and formal structures,
- are limited in scope,
- deal with agencies and not local people and
- allow little participation on the part of the people the work addresses.

These other factors have led to the development and use of participatory approaches to investigating, planning and implementing initiatives.

The terms which cover these participatory approaches include, among others:

- Participatory Rural Appraisal

- Rapid Rural Appraisal
- Participatory Action Research

Participatory approaches to development centre on the thesis that the people who are the focus of the development programme know more about their lives, environment and needs than the professionals who are working with them. Teams using participatory approaches generally seek the minimum level of information necessary to address an issue or problem, use several different sources of information and follow investigation, analysis and planning procedures which reflect the experience of the culture in which they are working.

Participatory planning procedures are iterative and flexible, allowing assessment and modification of strategies as the work unfolds. As well as setting objectives and deciding on methods to use in the early stages of the work, this procedure also includes deciding who should be involved and who should be informed about the project both in the community and externally. Project priorities can also be set, and must be done so in participation with all concerned groups.

3.2.1.1. Gender and Participation

Central to the 'Participation' approach to development is the principle that all sections of the 'user-community' should be involved with or have a say in the planning and management of their own lives and their own access to resources. This is particularly so in the case of women.

Women are often marginalised by traditional power structures, and their needs may not be reflected if decisions are taken in familiar (and hierarchical) ways.
The 'Participation' approach, therefore, requires that women are consulted at all stages of project design and implementation, from inception onwards. This approach has been used to some effect in projects concerned with natural resources, and the planning of water supply and sanitation systems (e.g. traditional birth attendants frequently have a say in water supply management), but there are only a few records of them being involved in the participative planning and management of energy supplies.

Women are often the primary consumers of domestic energy services, as they are traditionally responsible for cooking food for family groups. They can also be responsible for other labour-intensive food production tasks, (such as husking rice, threshing and grinding grain), which can be relieved by the introduction of improved energy technologies (e.g. improved water-powered mills).

3.2.2 Application of Participatory Planning Techniques to Electrification Schemes

***Stuff from coop paper below
Electricity
In contrast to this, user-controlled electrification schemes are usually initiated where a supply system has not previously existed. Poorer communities in developing countries cannot generally afford electricity, and may have other priorities (such as clean water supplies, or road access to the nearest urban centre). Electricity supply SHOs therefore often exist in communities which are relatively affluent in comparison with those which have water supply SHOs.

Despite this relative wealth, user groups are rarely rich, and are often established in regions where there are problems with the step-up in capacity (technical and managerial) required

for scheme management. This is exacerbated in countries (such as Nepal) where there are no established business units other than the family or individual.

SHOs involved in electricity provision can own generation capability as well as running power distribution networks. This occurs at all levels of scale.

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Stuff from WREC paper below*
Participatory approaches to planning in the electricity sector are rare, as the highly technical nature of such initiatives exclude most rural (and non-rural) people. In order to use such techniques for energy planning, close co-operation has been required between technical and development analysts and planners. Engineers and technicians must appreciate that the supply if electricity is only part of a complex system of development.

None-the less, electrification schemes can in fact only be designed and installed by trained engineers, financing can only be gained by economically sound propositions, and trained operators and managers are required to ensure scheme performance. The participative approaches described above therefore need some modification, to allow the involvement of stakeholders outside the immediate community. Consultation can take place in the process of demand assessment and load planning, ownership and financing models, management and operation. One way to do this is via a process of consultation involving an intermediary organisation which identifies and consults scheme stakeholders [24] in order to identify constraints to decentralised rural electrification and action needed to overcome those constraints. While this intermediary body can be formed in part from representatives of the user community, others must be involved in order to ensure scheme viability in other sectors.
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3.3. Case Study : Participative Planning Guidelines in Sri Lanka and Zimbabwe

This section details the experience of a piece of work being carried out by Intermediate Technology Consultants for the UK Department for International Development. The work is focused on developing guidelines for the participative planning of off-grid electricity supplies in Sri Lanka and Zimbabwe. The lessons from the two case study countries are then to be disseminated for international use.

3.3.1 Project objectives and approach
Accepting that community participation is an essential ingredient for the success of decentralised electrification projects, it must also be recognised that presenting the available options to rural populations will require certain simplifications. Issues such as how to decide on an appropriate technology, examining the resources, assessing the needs, finding the suppliers, financing, getting the system installed and maintaining them have to be dealt within the participatory process [Gunaratne, 1997].

The participative guidelines project attempts to do this by producing a planning manual so that people :

1. learn about the technology options available, and
2. make decisions on which technologies to implement them based on the resources available in their area.

The manual is accompanied by other documents which provide information on where to find these technologies and advisory services.

In the same way, a guideline for institutions has been developed for the benefit of commercial banks, government agencies and private sector promoters. This guideline attempts to create awareness amongst these institutions of the capabilities and limitations of rural communities. In promoting decentralised energy technologies, partnerships between the rural communities and these main stream institutions are essential, as they all have important roles to play.

3.3.2 Technology Choice

For the purpose of the "Participative Planning Guidelines" project, the review of technology options has been limited to those that represent realistic choices for rural electrification schemes:

- Diesel/petrol generating sets
- Small scale hydro power
- Solar photovoltaic (PV) systems
- Biofuels: biomass and biogas
- Wind power

With the exception of PV (and newer biomass applications), the technologies described above are mature and are not subject to engineering or developmental constraints. In each case, there are horror stories relating to poor maintenance programmes, lack of trained operators and engineers, shortage of spare parts, sub-standard installation. However, the constraints to the use of each technology are related, in general, to project implementation and management, rather than flaws in the technologies themselves.

As stated above, the guidelines produced in this project include a "Yellow Pages" of renewable energy services, which is a directory of expertise, hardware and service providers for each technology.

3.3.3 Assumptions and Reality

Before developing a successful planning guide for the communities, the project team had to overcome a number of assumptions which had been made early in the project development.

Motivation

The need for this project did not arise nor was it conceptualised in rural communities. It was developed by a group of outsiders with different preconceptions on rural energy needs, based on individual experiences of Energy and Development.
This is a basic flaw, as it means that the work was not 'participatory' itself from inception.
Participation of the community only happened after the planning manual was piloted in a village. It was discovered that in designing the guidelines, the team had made certain

assumptions of the technical capabilities at village level, as well as the willingness of people to get involved in energy projects in a unified manner.

Homogeneity

The other assumption was that the village, as it is identified geographically, will consist of people with similar interests and needs. In reality, people of varied interests and backgrounds inhabit any given area. Some may be involved in agriculture and others may be employed labour. Other basic differences are age, gender, caste and political affiliations, all of which produce a diversity of needs and aspirations of any community of people. Therefore, assuming that the village community is a homogeneous group of people in need of mobilisation through action of outsiders could lead to problems.

Electrification

Most rural householders will request grid electricity. Due to the topography (and demography) of remote areas, however, it is unlikely that grid networks will reach all rural populations in the near future. The reality is that alternative decentralised energy options are generally more appropriate in such situations - and that these require more user participation, on an individual or a community level.

None-the-less, the country project teams proved that communities can be mobilised and empowered through participation. The guidelines project attempts to find a way of empowering people to make their own decisions, but the challenge is to stimulate the community in such a way that it does not shift one dependency to another. They key is to meet the energy needs of people with minimum risk to them. The goal to keep in mind is to level the playing field to a situation enjoyed by the urban grid electricity consumers who assume very little risk when it comes to electricity.

3.3.3 Community Guideline Development

The initial scope of the project called for the development of a planning manual that would provide rural communities in Sri Lanka and Zimbabwe with sufficient information to :

- assess needs,
- renewable resources availability,
- identify expertise to assist design,
- secure financing,
- obtain hardware,
- install the system and maintain them.

It has rapidly become clear that there is a need for an intermediary who can help communities through the planning process.

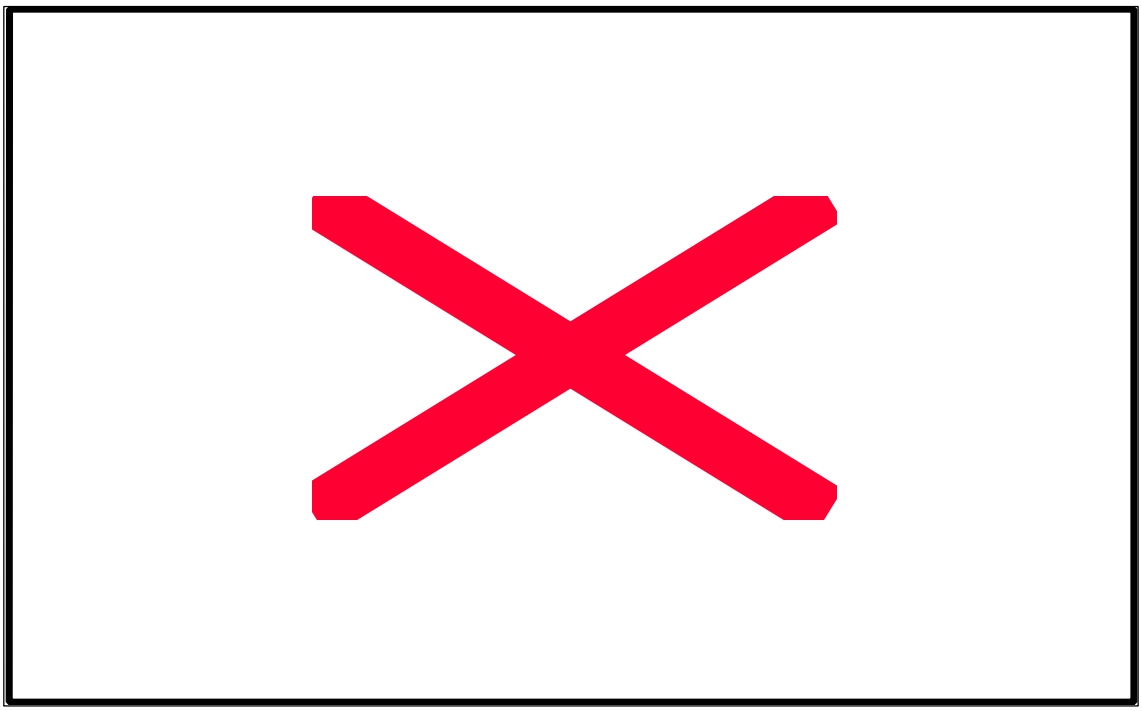
Zimbabwe

The Zimbabwe project team co-ordinated a workshop of local government officers and NGOs which produced a participation matrix (see Appendix 1) to guide the planning process. This was used as the basis of the planning manual in Zimbabwe. This matrix is the guide to an approach which enables communities to identify and prioritise their needs and to identify, select, install and operate a small scale decentralised energy technology to meet their needs. All the steps are being tested with communities, development partners, local experts and other stakeholders to generate a sustainable framework for their continued application. The guidelines have been developed and illustrated using project experience in two wards in the Manicaland Province of Zimbabwe. It is notable that the two provinces have advanced through the project development cycle at a significantly different rate of progress, despite similar external inputs [Chipare, 1997].

Sri Lanka

The experience in developing the community guidelines in Sri Lanka has been quite different. The first draft of the manual was found, on testing, to be too sophisticated for the target audience. On revision, the manual was taken to two villages in Galle and Matara districts. The Sri Lankan project team chose to guide the community through the project cycle by using a cartoon depicting a story based in a rural community around a leader named Sunil (see figure 1).

Figure 1: Cartoon used in Community Guidelines: Sunil's story



This simplifies the process into stages that are easy to follow. The cartoon is followed in the manual by a description of the technology options, including a comparison of financial costs. The Sri Lankan trials of the manual showed that participants were eager to learn about off-grid electricity options.

Difficulties were found, however, because:

- different participants had different reactions to the manual and acted as individuals and not as a community
- most of the participants were biased towards solar photovoltaic systems as they has seen this technology in a near by village
- participants in general found it difficult to grasp the cost comparison calculations to compare technologies.

It has become clear that the community will have to have external intervention to be guided through the process at each stage.

3.3.4 Institutional Guideline Development

The project identified that it is necessary to bridge the gap between rural communities and the financial institutions that could be involved in financing an energy project. Not only was it realised that there was a lack of knowledge in the villages of what financial options were available to them, it also became obvious that the main stream financial institutions had very little experience in the rural sector. In order for the institutions to become more active in this sector, it is necessary for them to become more familiar with the village level capabilities and limitations for organisation and developing projects.

Zimbabwe

In Zimbabwe, the booklets produced were targeted more directly at informing the community on how to approach a financial institution for project funding. Two booklets were produced on the subjects of 'Institutional support' and 'Financial investment'. The former assists a community in the formulation of a project proposal, and provides an insight into the institutional support available to them. The latter assists communities in producing a sound proposal to a financing institution, and provides advice on the requirements for obtaining financing.

These guidelines have been distributed to institutions, local government and energy developers in the country as part of informing the debate on rural decentralised energy supply. It is still too early to evaluate the effect of the guidelines on the rate of uptake of renewable energy technologies installations, but a certain level of awareness has been raised. This is evidenced by the general thrust of thinking especially within the Department of Energy, the private sector and NGOs where the issue of a renewable energy fund has been mooted.

Sri Lanka

The Sri Lankan team have produced a guideline booklet for financial institutions, with the objective of:

- Increasing Institutional confidence in decentralised energy technologies and schemes for rural communities.
- Increasing Institutional confidence in the capabilities of rural communities in the development of rural energy schemes
- Increasing Institutional awareness of the infrastructure that already exists in rural communities that can support the implementation of energy schemes.

As part of the process of developing the guidelines, informal discussions were held with various individuals representing banks, consulting companies and NGOs on their perceptions of rural communities. In discussing hypothetical situations of funding rural community based energy projects, many banks were cautious due to their inexperience in rural lending.

The resulting guidelines describe the technical options, including some case studies of existing projects. Also there is a section on existing rural organisations for handling rural credit. In many cases in Sri Lanka, the main organisation for rural credit schemes is the Death Benefit Society, however, other organisations are described. The booklet also discusses the rural income patterns.

Though the two countries have taken different approaches to bridging the gap, they both have the same goal of improving access to finance for rural energy projects.

3.3.5 Common Elements From International Experience

A workshop held in Colombo in November 1998, brought together the Sri Lanka and Zimbabwe teams along with members of Intermediate Technology's energy programmes in Nepal and Peru. One aim of this meeting was to draw out the common elements from the various experience of rural community energy projects. Some of the main points identified at this meeting were:

3.3.5.1. Village level

- Village level guidelines must be:
  - simple to follow
  - in the local language;
  - culturally sensitive; and
  - have illustrative pictures.
- The village guidelines need to be flexible, as communities are varied and not homogeneous.
- There is a need for technical and managerial training in the village from the early stages of project development.

3.3.5.2. Intermediary

- The participative planning of rural energy service provision requires a 'catalyst' or intermediary who can encourage and assist the village through the project development, including facilitating linkages with financial institutions.
- The communities cannot be expected to produce a project proposal, but to produce the ideas. It is the role of the intermediary to help the communities develop the proposal to be presented to the financial institution

3.3.5.3.Institutions and private sector

- The private sector is, in general, reluctant to become involved with rural communities. Policies that encourage private sector involvement in rural community projects in general, and energy projects in particular, need to be introduced.
- There is a need to influence aid agencies and donors to provide appropriate financing options for rural off-grid electricity projects, in order to ensure that such projects are sustainable.

3.4. Feedback from Kenya

5.2.1 Planning manual – Sri Lanka

An easy to read manual, giving information on different technologies to enable communities to make informed choices. The yellow pages are comprehensive and easy to read. Use of cartoons makes it easy to read and understand.

Some of the ideas on community involvement /participation could be introduced in Sunil's story cartoons with captions that emphasize on this.

A mention could have been made of the need to develop a proposal before approaching funding institutions in the introductory part of the pink pages.

5.2.2 The draft planning and institutional guidelines from Sri Lanka

It might be useful to specify the actual users of the manual in the introduction. Although the manuals are meant to help communities to plan energy programmes, there are those who will specifically interpret the manual on their behalf.

Sections 2.0 and 3.0 is rather technical and probably not necessary at the beginning as they might confuse that user who is not very conversant with planning energy projects. This information could however be included as an appendix as "other information" for that user who might want to read more.

Some of the information on "Technical criteria for selection of energy options (4.0, pg.9)" might be easier to understand if put in table form.

The technology selection matrix (6.0 pg. 33) might be more useful and consistent if brought forward to the end of chapter on 'technical criteria' (pg. 12).

Chapter 5 (pg. 13 - 32). Reference could be made here that more details could be found in the yellow pages of the planning manual.

Information in chapter 5 might be easier to follow if topics are re-organised in a standard format for all the energy options i.e. criteria in selecting, advantages and disadvantages, cost of project , after sale service, organisations offering certain services.

3.5. Feedback from Nepal

3.6. Conclusions from the Participative Planning Guideline Project

The initial feedback from the piloting of the planning manuals show that the project will be useful in bridging the gap between decentralised renewable energy technologies and the end user.
The project discovered, however, that its initial assumption (that a community would carry out the entire process from conceptualisation to implementation of energy projects) is unrealistic, due to various factors, including :

1. the high level of technical sophistication involved in many energy service supply options
2. the diversity of rural community populations and their energy needs and interests.

and that communities need some sort of sustainable support structure in order to implement improved energy services.

It is therefore obvious that this paper recommends the development of such support structures as a matter of urgency.

Appendix 1: Draft Participation Matrix

Activity	What will be done?	Who will do it?	How will it be done?
Needs assessment	Articulate needs	Rural communities (RC), development partners (DP), local experts (LE)	- Participation, RC de needs; DP & LE ref - DP & LE direct dialo
Prioritisation of needs	Prioritise & select most critical ones	DP, LE & RC	- Participatory, DP direc RC Confirms priority
Formulation	Systematise planning to realise objectives	DP, LE, RE & other stakeholders	- Participatory, dialog consultation - Local knowledge in - Consider available
Development	Concretise plan, organise resources & Coordinating	All stakeholders	- Participation - Local involvement (consultation)
Implementation	Actualising with specific activities	All stakeholders with emphasis on RC & LE	- Hands on involvem - Spread roles amon participants - Local contribution (f skills, etc.)
Monitoring	Deliberate effort to note progress against plans, at all stages	RC, LE & RC	- LE & RC participate
Evaluation	Based on note above, measure success, failure, lessons & recommend corresponding actions	LE, DP & RC	- Field observations - Actual measuremer - Interviews with RC - Local level worksho
Control	Correcting at all stages	All actors involved at various stages	Checks and corrections

Notes: RC = rural community, DP = development partner, LE local expert. Local inputs being maximised; networking/linkages being created and maintained. Awareness being through exchange visits.

PART II : CASE STUDIES

Stuff in here from the various participants at the workshop/seminar in Sri Lanka

4. Energy and participative planning in Nepal with special focus on the micro-hydro sector

4.1. Context

Nepal, a himalayan country landlocked by India and China, has a total land area of 147,188 sq km, 885 km from east to west and between 145 to 241 km from North to South with an altitude ranging from 60 meters above sea level in south eastern terai up to 8848m at the summit of Mount Everest. With about 90% of the estimated 21 million population living in rural areas, the country remains rooted largely to a subsistence agricultural base. Administratively, the country is divided into 14 zones and 75 districts. In the north, is the himalayan range, where nine of the World's highest mountains, amongst them the tallest Everest exists and the south forms part of the gangetic plains. The northern Himalayan region covers 15% of the total area with 8.7% of the population. The mountain region or the mid-hills covers 68% of the landmass (47.7% population) and the southern terai occupying about 17%, also the most fertile with about 43.6% of the country's population. Nepal earns its income from a large tourist base. Carpet and Garments form 68% of the country's total exports. The UNDP Human Development report places Nepal at 154 position among 175 countries.

With a 104 year autocratic Rana Regime, a 30 year panchayat Raj, and a new democratic nation from 1990 onwards, Nepal continues to reel under government instability till today. With a GNP per capita estimated at US$200 (in 1995), Nepal comes in economically as one of the poorest countries in the World. Adult literacy rate stands at 35.6% in 1996. The country houses about 75 different ethnic groups speaking 50 languages. Nepali is the lingua franca for about 58% of the population. Life expectancy at birth is estimated to be 54.9 years for women and 55.8 for men.

4.2. Energy options and their current use in Nepal

Compared to other neighboring countries, Nepals' dependence on traditional fuel is high. With the countrys rough geographical terrain, where road access is limited, kerosene is an expensive option. Kerosene as a substitute is limited to urban areas and its peripheries. A majority therefore depends solely on biomass, particularly for cooking and heating needs. Forest occupy 39% of the landmass and account for 79% of the country's total energy consumption and more than 90% of rural household energy consumption. The Economic Survey of Nepal 1991-92 states that Nepal spent 32% of merchandise export for import of fossil fuels.

Energy development policies were formally introduced only from the Sixth Five Year Plan period (1975-80) with a broad aim to minimize fuelwood and fossil fuels with indigenously produced electricity and conserve energy

through efficient utilization. The Seventh Plan (1985-90) attached priorities to increased opportunities for production, employment and fulfillment of basic needs. Fuelwood was considered primarily as a basic needs and tree plantation programmes were emphasized. Rural Electrification program was conceived to assist the growth of farm output and development of cottage and small industries. Alternate energy resource like biogas, micro-hydro, improved cookstoves and solar were encouraged. The Eighth Plan (1992-97) tried to maximize the development of indigenous energy resources, devise appropriate mechanisms for financing hydropower projects, to enter into import-export agreements, pricing energy to reflect social cost, balance energy development and environmental protection and transfer of government energy sector utilities to private sector. However, although Nepal possesses many alternative energy forms, there has been a lack of effective policy implementation, practices, finance and institutions to make it a real success.

Effective energy options are limited and the country struggles in the search for an instant remedy. Big hydro options are the key ideas in the issues of development. With Nepals' difficult topography, this however becomes a very expensive option for most parts of the country and renewable energy is being promoted in these areas. Within this renewable sector are options such as bio-gas (cooking and sometimes household lighting), solar lighting, improved cook stoves and micro-hydro. These together provide an option to energy needs on a small scale, a majority at the household level. The introduction of these technologies have been very new to Nepal and although on a wider level, most of the renewable energy programmes can be seen as effective, there are many inherent problems that lie with the sustainability of such projects. Presented briefly below are some features of the options:

4.2.1. Hydro

With about 6000 rivers adding up to 45,000 km in length and an average run off estimated at 170 billion m3, Nepal abounds in one of the World's highest water resources. Electricity was sorted as a government enterprise with the Small Hydropower Development Board in 1975. The Rural Electrification Directorate of Nepal Electricity Authority (NEA) is the continuation of the above board. An output of only 251 MW, 0.5% of the estimated harnessing of the water resources, provides power to about 15% of Nepal's 71 districts, mostly urban. With much of the power needs and policies focused on export or the main cities, rural areas having access to it is largely left a vacuum.

In addition, roughly 10% of the hilly population, is being served by micro-hydro power which uses water from small streams and rivers to power mills (for agro-processing) and the generation of electricity. For centuries, communities all over Nepal used traditional ghattas to grind grains. There has been an estimated 25,000 generating a total power of 10MW, each generating about 400W. With an overall subsidy of 20-30%, micro-hydro plants, with a totaled installation of about 7-8 MW have been a boon for about 2 million people who have had no access to power. Small scale turbine technology has been developed in Nepal since 1960's and today is well established with 8 local manufacturers having installed 900 MHP turbines, owned and operated by

individual owners with about 100 with add-on generators. About 20 plants are electricity stand alone schemes (ICIMOD). Additionally about 420 peltrics have been installed (Kapali, 1997).

4.2.2. Biogas

The initiative of promoting biogas in Nepal began in early 1970 but systematic approaches started in 1977 with the establishment of the Gobar Gas and Agricultural Equipment Development Company Private Limited popularly known as GGC as a specialized agency under a joint investment with the ADBN and the UMN. The Biogas Company initially promoted the floating Steel Drum biogas digester, a technology imported from India, but over the years had exclusively shifted to the promotion of the fixed concrete dome type, a technology imported from China and this was mainly because of the fact that this was using local material - sandstones, bricks and cement. A Seventh five year plan target of 4000 plants between 1985 to 1990 was easily achieved and the government set up a further target of 30,000 by 1997. In 1992, a joint programme of the government Agricultural Development Bank Nepal (ADBN), GGC and SNV (Bio Gas Support Programme) started with an objective to construct 20,000 biogas plants within 1992-97 by an investment subsidy provision. Subsidy assistance to users were provided in the form of Nrs 7,000 for terai, Nrs 10,000 in hills and Nrs 12,000 in remote hills for biogas installations. In 1990/91 when the government discontinued the subsidy, demand reduced substantially. With the introduction of a continued subsidy, the physical target of 20,200 biogas plant installations were achieved by end february 1997. The main accumulated benefits included 200 million hours of workload reduction, improvement of health, 545 million kg of saving firewood with cooking, 7.3 million liters of kerosene saved by lighting, a 900,000 ton of CO2 reduction and continuous availability of slurry for sustained soil fertility and crop production. (Wim van Nes, BSP, 1997). At present, 23 biogas companies construct and install plants and eight more have been approved to construct them. A further third phase for the period 1997-2002 has been started with a targeted 100,000 biogas installation commissioned.

4.2.3. Improved Cook Stoves (ICS)

Improved Cook Stoves (ICS) has been promoted in the country for some time now. It was in the early ‘80s that R&D activities were conducted in the field where different types of ICS such as ceramic, mud, metallic, mud/brick/stone had been designed. Till 1991, more than 60 thousand ICS were installed. With efficiencies ranging from 21 to 28 percent in field conditions, ICS also benefits users with reduction in the carbon monoxide level in the kitchen. About 25 Organisations are actively involved in the promotion of the ICS. There are 5 types currently used, with the Improved Tamang Stove being most successful with around 35,000 installed till today. At present, there is no estimate as to how many ICS have been installed. (Sulpya K.M, unpublished 1997)

4.2.4. Solar

The development of solar units have been recent and mostly urban catered with a slow direction towards village electrification. There are three private solar companies in Nepal: Lotus Energy, Solar Electric Company and Wisdom Light. The government has started subsidizing 50% of any village solar installation which is being channeled through the government Agricultural Development Bank Nepal (ADBN). The trend of subsidy is favorable with a considerable increase the past three years, from 0.6 million nepalese rupees in the first year to 2.5 million the second year to the present 7 million nepalese rupees (Source ADBN).

Renewable energy thus provides a good option at the moment for many rural communities in the country. However, introduction of the technology alone does not seem to be the factor alone for success. With the exception of biogas - which has a hugely successful subsidy back up, improved cookstoves and micro-hydro particularly are affected hugely by socio-economic limitations, a growing concern in the recent years. Following is a brief analysis of the micro-hydro initiatives in community participation.

4.3. Participative Planning in the Micro-Hydro Sector

Participation means a clear involvement of stakeholders in any project which would basically include: promoters and the beneficiaries, donors and peripheral beneficiaries if there are any. In the micro-hydro sector, technology is often the know-how reserved for technicians and each level of technical knowledge from the manufacturers to an overseer has its boundaries that limitedly crosses over to the beneficiaries. Participation, as a transfer of knowledge, is a new concept that remains a challenge, especially in the micro-hydro sector. The higher level of involving more people into the technology transfer is by far, minimal.

In the Nepal Micro-hydro case, participation is often limited to community led and owned electrification schemes, which is donor driven in most cases. Participation is almost non-existent when the schemes are entrepreneur led. It is generally believed that equitable distribution is brought about only after equitable participation takes place while constructing a micro-hydro scheme. The level of participation is at the most physical labour, limited to a few days. Every house in the village usually give free labour for the required number of days that the managing committee decides. Most of the ideas and knowledge needed for an effective participatory exercise remains with the outsider and in the best cases, with the “chosen few” of the village leaders. The scope on participative planning is still a wide arena that needs to be widened but nonetheless has started in community led schemes in Nepal.

The Community led experiences, though limited in numbers, have been interesting. Participation is felt to be important for the success of a community owned MHP plant but the people involved and the level of participation determines that. In many community owned schemes, people get involved from the beginning of a project. A Village Electrification Committee is officially formed with members of the community, mostly ward (the smallest political/social unit in a village) leaders, who combine their skills to manage and run the scheme. The planning exercise however is limited to a few in numbers. The emphasis is to let people take control over the project so that it remains sustainable. However, it is also gradually found that this process needs a lot of "holding hands" initially for it to be successful. Communities often take projects for granted and voluntarily choose to not "own" a plant for the high risk it offers. This is especially true in donor/organisation led schemes. For example, the government body, Remote Area Development Committee has plans to install about 10 new MHP Plants every year. All schemes are said to be community owned but then in all cases participatory planning is remote. The need for this is largely being felt now as embroiled already in bureaucratic processes, people do not have the necessary knowledge of "running" the Project on their own, which is leading to increased failure rates. Also, the non-ownership feeling is very strong. Although a community would participate and give time to build a project, they would still refer it to as a "government project". A feasibility survey, for example takes into account the technical details with only a few members from the village and therefore already, the scope of planning gets limited. Today there has been a gradual push for a wider incorporation of people's idea and participation in this stage itself.

More successful have been the integrated participatory approach of the Annapurna Conservation Area Project, who deal with communities directly from the inception to the post-installation management. Communities are incharge to plan the project with only but a slight directional lead from the outsider. There is clearly a marked difference in the two approaches and the importance of participation towards the success of a Plant is clearly evident. A continuous dialogue with village members remains the key in participative planning. Although it is limited and time consuming, the process does show favourable responses. However, there are still gaps within the processes. The ACAP led 50kW Ghandruk Scheme is considered to be one of the most successful community managed MHP Plant but inherent within the social system is also an imbalanced participatory process where all members of the community participate in voluntary labour or cash but do not necessarily receive equal power distribution, even when they want to because of the limited capacity the plant has to offer. Participatory planning therefore has to be clearly thought through where each economic level/ rung of people should have a mechanism for equitable participation and therefore equitable rights.

The importance of people as "active partners" is an important factor that determines the success of a project. People in villages do not have rigid planning systems that urban planners have and this can sometimes be misunderstood in realistically implementing a planned project. For example, while implementing a project, people had no concept of a "time plan" and work

delayed over and over again. Where people have to work in a tightly scheduled agricultural season, collect fuelwood, and do other chores, participation often has to be seen as season bound. The lack of "getting to know the other" could hamper the step to an effective participation. In a 50kW MHP project that is being installed, it was found that though a managing committee was formed, the process was slow, clearly for a lack of knowledge from the people about a technology as new and challenging in a fairly remote area. Village level management are often left to themselves to manage the processes effectively.

It is often found that users do not get to know the real data and are often confused when sometimes they want to use multiple high wattage electrical equipments in an environment with a limited energy supply. In Ghandruk, women switch on an electrical cooker and light bulbs, managing both within 300 Watts of power. A lodge manages 2 cookers (for cooking and water heating), a fridge, 25 bulbs, a water heating backup system within a flat rated 1200 Watt power subscription. Effective household energy management in these cases came with time but this effectively could come in the planning process. Individuals have to be sure of how much their energy needs are and then proceed onwards to plan effectively for the participation required.

4.4. How would participative planning be more effective?

The prevalent cases of participation limits itself to a few "elders" or "privileged" within the community. Also, women who form an integral role in participation often do not get involved in the decision making process. Often when they do participate, they have to put in double the effort as they are already overburdened with domestic work. Equitable participation of men and women in physical labour could sometimes be a wrong concept. If projects want their women to be as effective, they have to be involved in the various decision making process and not necessarily put in equal labour. Women are often sheltered and technology is reserved as a domain for men. If women have to be involved, mobilisation and education are very important since they form major players in domestic energy needs and consumption. Facing similar problems are also people from the lower economic strata. If one cannot afford more than a 100W, why participate equally? This was a voice heard from a poor man on a visit to a much successful site. With issues as complicated as these, participation in planning and in management is often an egg shell to walk upon and not as easy as "equal participation" of men and women.

It is largely acknowledged today that a micro-hydro scheme, especially an Electrification Stand Alone, is a Project with a high risk. Peoples participation therefore is important primarily for these reasons:

- That they feel that they own the Scheme or at least are a part of it
- That they get involved in planning, so that they are clear as to what is expected of them and what they could offer

Participation starts with the planner. It is important that people are fed the right data and of how much each party gets to know each other. Participation should be a two way process where each party plays a unique role in firstly understanding each other and then sieving out the information needed that would make the project work. In micro-hydro schemes, this sieving out process is often missed and information flow dealt with singularly, often leaving out the beneficiaries. The need to involve people in a “high level of technology” is not felt. The same machines are then left for the same people to manage it and run it well. Appropriate participatory trainings are the need but this continues to lack.

Lately, it has been strongly felt that village level dissemination has been very weak and if we are to make participation levels high with decentralized partners, this has got to be very important in the success of participatory planning. The need for a strong management was and continues to be felt via a series of studies. This issue has been taken up by ITDG Nepal with the development of a Management Guideline which will take into consideration processes that need to be understood from the pre-installation stages to the post - installation stages of managing a scheme. With the success of some community schemes in Nepal, in the electrification sector, the processes of participation are to be a major highlight in this document meant primarily for entrepreneurs and practitioners. ITDG Nepal has already developed a Financial Guideline in 1996 taking into consideration basic financial understanding to start a micro-hydro project. With the first publication in English, this guideline is now being converted to a nepali version for prospective entrepreneurs and communities in the field. This will be an ongoing process with reviews and revisions. The nepali version already has taken some into considerations and this will be tried and tested with training modules. Unless there is a co-ordinated effort from all partners, participatory planning and management, an approach needed for successful project interventions, will continue to be a challenge for sustaining technologies as complicated as micro-hydro.

5. Kenya

5.1 Introduction

The Participative Planning Guidelines for off-grid electricity developed in Sri Lanka and Zimbabwe, share similar principles with other participatory methodologies in community development in the following ways: -

- The approaches involve creating awareness to leaders and building their capacity to seek participation of communities.
- Identifying problems, scope, causes and consequences with communities
- Formulation of action plans
- Identification and search for resources (structures, funds etc.)
- Formation of committees to manage projects.

The manuals have great potential for application in Kenya as will be demonstrated at a later section of this review. The IT Kenya Energy team is implementing a pilot micro-hydro project and the guidelines will used. The IT Kenya energy team has a lot of experience in using participatory methodologies in biomass energy projects but minimal experience in micro-hydro projects.

When reviewing the manuals and the guidelines the reviewing team assumed the position of a community simply a layman's point of view. The following comments are therefore meant to improve the manuals to make them easier to read, understand and use from that point view.

The manuals are rather silent on information on how the community is chosen before the participation can start. The issue of constituting a community is not clear. The manuals therefore assumes that the community is already existing. Even if the community is existing, the guidelines do not explain how they will come together to pursue a common interest.

Community mobilisation and sensitisation are essential in order to motivate the community to be interested. Once interested, they will participate fully in the project, right from problem identification to development, implementation and evaluation. A section on this should probably be included in the *'How to use section'* of the manuals. Maximum commitment will be achieved by working *with* the community and not *for* the community. This will in-turn facilitate local or community ownership of the project, and ensure sustainability. Building capacity of communities is essential for efficient project management, and therefore needs to be emphasised in the manuals.

The final user might not necessarily be familiar or aware of the importance of the aspects that make a community project succeed (eg. participation through mobilisation, capacity building etc.), and should therefore be sensitised to some extent, by reading these manuals.

5.2 Some specific Details for each manual

** Moved to Section 3.4**

5.3. Case Studies in Kenya

5.3.1 Introduction:

This section is to assist in understanding the Kenyan Context of participative planning activities with Kenyan Communities. The cases given are those who have worked before with IT Kenya. Two cases are reviewed. One an activity from the Transport Programme and the other from the biomass energy activities by the Energy programme. The two explores the scope of applying participative planning methods on general terms. The last section of the report look at the applicability of the participative approaches in the Kenyan energy sector.

IT Kenya uses participatory approaches in working with the communities in almost all its projects. The projects have developed tools to assist project interventions to be undertaken in a participatory manner. These are specifically used with communities to enable them to "own" the process and the technologies.

The two cases studies that follow indicate that participative planning increases the level of involvement of the communities and improves chances of sustainability of a technology project. The two cases demonstrate that apart from involving the community during the implementation stages, it is important to involve them in formulating and administering in-built monitoring mechanisms right from project start. This motivates communities to acknowledge that problems exist, and that they are capable of doing *something* to overcome them. Involving them in identifying problems and identifying the most appropriate options makes it possible for them to participate in the implementation of options. The two case studies below will illustrate the scope of the potential of applying particiaptive planning guidelines in Kenya.

5.3.2 Case study one: Kathekani Rural Transport (KART) Project.

5.3.2.1 Introduction

The project is located in Kathekani location, which lies in one of the semi -arid districts of Kenya. The area suffers persistent drought, and is therefore not very productive. This has affected development activities in general. IT Kenya first made contact with the local administration in the project area, and was referred to the Location Development Committee. Discussions followed and the team mobilized the community through the Village Development Committee, and raised awareness of transport problems through meetings. Pictures of different transport technologies were used to initiate discussions. Communities were involved in identifying their own transport problems through analysis of daily time schedules both during village meetings, and at the household level.

5.3.2.2 Project Development

During meetings at both village and sub location level, and using PRA methods, community members went further to discuss and identify the best possible options for addressing their transport problems. The members had by this time agreed that transport was an issue that needed to be addressed. This led to the formation of the Village Transport Committee, which was charged with the responsibility of mobilising the community. Following discussions with the committee, and after creating awareness among community members, 3 villages out of 25 were selected for piloting the idea. IT staff, in collaboration with the community developed 3 cycle trailers for testing in the villages. These were taken to the villages and circulated for use among different families. They reported back their findings to the committee and recommended adaptations to suit their needs. Their ideas were incorporated, and an improved handcart was designed. This was further field tested with the communities and was highly acceptable. Artisans were trained to produce the handcarts for interested community members.

Meanwhile, community members from other villages were interested in what was going on in the pilot villages and expressed interest in acquiring these technologies. The issue of who was going to be responsible for coordinating activities in the non-pilot and the pilot villages to ensure smooth running arose. A central committee (Kathekani Rural Transport Committee) was therefore formed at the location level with representatives from both pilot and non-pilot villages.

5.3.2.3 Project management

The Kathekani Rural Transport Committee is responsible for:

- Promotion and coordination of development activities
- Mobilisation of resources both locally and externally
- Linking communities with support systems

Besides managing the technology aspect of transport, the committee also mobilises communities to participate in improving transport infrastructure.

The committee members were given training on community mobilisation and project management. Training took different shapes, from field visits to exchange visits to other districts etc. The committees are now responsible for coordination of activities in their respective villages. Ongoing discussions during monthly meetings attended by IT staff and committee members help to iron out possible problems, including those identified by IT staff during discussions with community members in the field. Any new information is also passed on during these meetings. IT staff work in collaboration with other development organisations/ government staff, who are available to address any issues that they might be called upon to. This also links up communities with other support institutions for support in future when IT support comes to an end.

5.3.2.4 Evolving technologies

With time, communities started using donkeys to pull the handcarts especially when children were sent to perform tasks. This therefore raised the need for donkey drawn carts. These were developed in consultation with the community, field tested and finally disseminated. Other technologies have evolved in the same way and include extended bicycles and cycle trailers. The community members have a lot of say in the specifics of a particular technology during development. For example, they recommended use of tubeless or solid tyres for the range of technologies, to ensure durability. They were then linked to manufactures that agreed to be producing for them.

5.3.2.5 Financing

Money for developing the initial technologies was provided by the support organisation (IT Kenya). To be able to acquire the technologies, community members service a revolving fund, which is managed by the central committee). They register with the committee and slowly pay for the technology they wish to acquire, until the payment reaches 40% of the total cost. The committee then places an order for the technology with the artisans and pays for it. This is then delivered to the member who on delivery, enters into an agreement with the committee regarding the mode of payment of the remaining 60%. If for any reason a member is not able to make payments as agreed, this is discussed and repayment period extended.

5.3.2.6 implementation

By December 1997, over 35 households had acquired one or other type of transport technology to help ease transport problems. The project has also benefited those members who would never have been able to accumulate sufficient savings to buy

the technologies. The transport technologies enable them to transport commodities in larger quantities, which saves time and energy. It makes it easier and less tiring for members to fetch water and firewood, tasks which are often time consuming and require that one travel long distances.

Lesson: The case shows that there is clearly a very fertile ground for the application of participative methods in planning for development activities with communities in Kenya. It will even be easier to apply the methods is there are formal guidelines for the methods and if the guidelines are targeted for a particular purpose as in off-grid electricity.

5.3.3 Case 2: IT Kenya biomass energy Activities

5.3.3.1 Introduction

The programme's aim is to enable significant numbers of poor households to reduce the problems they face as a result of their dependence on biomass fuel, by increasing their access to appropriate energy efficient technologies.

The programme has a long history of introducing improved biomass energy technologies and approaches to the communities. The most important attribute of the programme is the use of participatory methods in technology development, in programme activities. The programme concentrates its resources in one activity until proven beyond doubt (in collaboration with communities), before disseminating it or introducing it to other organisations. The programme also documents all the lessons learned from these activities and shares them with other partners. The technologies and approaches promoted are simple, user friendly, affordable and adaptable.

In 1986, IT Kenya in collaboration with KENGO (an environment and energy NGO) embarked on activities to identify stove needs of households in the rural areas under a project "Wood-burning Stoves Field Test Project". The aim was to test a number of existing improved stove designs in order to provide other organisations with guidelines for choosing appropriate stove designs for dissemination in rural areas. The communities, and in particular women, were fully involved. The "Maendeleo/Upesi" wood burning stove emerged, as the stove that suited users needs best.

Later in 1987, IT Kenya and KENGO again started the Women Porter Training Project whose aim was to equip the women potters in West Kenya with skills to increase the profits from their stove businesses and increase production of the charcoal burning *KCJ* liners in the area. One women's group in Kisumu district was trained to produce the "Maendeleo/Upesi" stoves. The project proved successful and led on to the inception of yet another project, The Rural Stoves West Kenya (RSWK) Project.

5.3.3.2 Training women to disseminate the technology

The Energy Programme initiated the training of selected Women's groups to produce and market the fuel-efficient ceramic stove. These activities were done in collaboration with other organisations and government departments at various phases. For example, the ministry of Agriculture was involved in the dissemination phase. The price of the stove was subsidized to speed up adoption in the early stages. Marketing campaigns and training were necessary to create product awareness and thus increase sales. Women being the producers encountered problems especially in transporting the stoves to the market. Current project activities are aimed at establishing a commercial approach to rural stoves.

5.3.3.3 Evolving Technologies

The need for a portable stove arose because most users felt that it would be advantageous if they had a stove that they could carry and cook outside. Others living in rented accommodation did not want to invest in a technology that they would be forced to leave behind when they left. This resulted in the cladding of the *upesi* liner using metal on the outside and insulating material in between to improve heat retention. The price of the portable stove was higher.

Some community members later felt that the cost of the portable *upesi* stove was limiting to some of the users who wanted a portable stove. This led to the development of the *upesi lira* stove, based on ideas from a design made by communities in Uganda without a mould. The stove was developed to incorporate a ceramic base and ceramic handles, which would help to lower the cost. It was developed and tested with the communities until the desired result was achieved.

The need for a more efficient method of firing the stoves arose, and this led to the design and testing of "The Better Bonfire Kiln". The women producers were fully involved in the development and test phases and are using the improved kiln today, for firing the stoves and other clay products such as pots. Besides producing the initial "Upesi" stove, the eight women's groups now produce variations to offer users more choices and enable them reach a wider market. Apart from ceramic stoves, women members have been involved in the promotion and construction of mudstoves. They have been introduced to a very innovative method of identifying their energy problems and formulating strategies for addressing them.

To share these experiences, the producers are used to train others within the East African region. Training is often done at their production centres.

5.3.3.4 The Approach

The programme approach is based upon involving communities in product development, and giving them choices. The activities and training given are based upon production of clay liners, design and use of paddle moulds, clay testing, clay mixing and preparation, exploring traditional pottery techniques, traditional firing techniques and improved kilns, production training, quality control identifying suitable producers, liner installation and installation training. This has been possible through mobilising the communities through participatory approaches such as the *Participatory Exploratory Of Options for Local Energy (PEOPLE*) Approach and Group Led Action Plans (GLAP), right from the beginning.

5.3.3.5 Community Participation in identifying energy needs and options

The importance of involving people /communities in identifying their own needs cannot be overemphasised. IT Kenya Energy Programme through the Household energy Regional *HER*) Project has developed and has been using the *PEOPLE* Approach to enable communities to assess their energy needs and options. Participation by the communities in setting out stoves and household energy priorities and working out plans towards addressing energy problems themselves is key to effective implementation of activities. Participation in stoves and household energy work includes involving communities in identifying, discussing, designing, implementing and evaluating energy activities for themselves.

The underlying principles of participatory needs assessment in stoves and energy work include:

- women and men have a wealth of traditional knowledge which they use as coping strategies to deal with energy problems and can appraise new options for themselves
- The role of the outsider is to learn, convene, and catalyse sharing of information among the communities. Involvement of marginal groups provides techniques for people to do their own assessment collectively in the process suggesting new options for themselves.

The aim of *PEOPLE* Approach is not to introduce any specific energy technology. It is to encourage communities to better understand their energy problems and assess ways of addressing them and to expand their choices of access to appropriate interventions.

5.3.3.6 The 'PEOPLE' Approach

The approach enables communities and grassroots agencies to jointly identify their energy problems and assess ways of addressing them. The aim is to do this in a way that maximises people's participation in decision-making, that considers many options not just one solutions (particularly drawing on indigenous knowledge and local adaptations), and that maximises the chance of options chosen actually being appropriate to the community needs and situation. This involves sharing information:

- Information flows from individuals in the community into a common, visible, pool.
- Information flow from the agency into the shared pool;
- Participatory methods used to visualise the information so it can be understood and revised by all.
- Use of methods that enable people to analyse information and make decisions jointly

Adoption of the improved stove technologies has been increased through non-technical aspects of production training in areas such as: planning and organising, group organisation, business and marketing. From the project's more recent work, it is evident that the "Upesi" stove may not necessarily be an appropriate stove in other areas. What can therefore be shared are the principles of choosing, adapting or designing a stove to meet local needs through community involvement. For example, experience has shown that assessing and understanding household energy needs is a complex process, but is crucial to the success of stoves or energy projects. Many development projects are keen to promote improved stoves to meet a single perceived need namely, fuel savings. However, other vital but complex issues are often ignored. Below are two examples:

- The other needs currently being met by the existing technology: e.g. the 3-stone fire provides both space heating and light in the kitchen, and that, smoke controls pests and insects.
- The other needs (or wants) that an improved stove can address: e.g. improved stoves are often valued for time saving and as status symbols more than for the fuel savings they offer.

Lessons: The case has illustrated that although participative planning guidelines are applicable in energy projects, the method of introduction to the community may differ but the principles are the same. In other words, the community as defined by its interests would determine the method how the guidelines could be introduced and later applied. The case also illustrates the need to *empower* the community that are

supposed to apply the guidelines. It was mentioned in the introduction of this review that the Zimbabwean and the Sri Lankan manuals are silent on how the communities will be *selected* or *identified* or *made* to *participate* in the participative guidelines. They *assumed* that the *community* for participation. The GLAP process mentioned in the case illustrates this very well.

5.4. Potential application of the guidelines: an example of to the community micro hydro project being implemented by IT Kenya and the ministry of energy in Kenya.

5.4.1 General overview and Introduction

The mountain formations and the wet highlands of Kenya hold a considerable potential of hydro energy. The highlands consist of volcanic landscapes of Mt Kenya, Aberdares, Mt. Elgon, Mau escarpment and Kisii highlands. Other areas holding some potential are the Kerio escarpment, Nandi escarpment, and Lake Victoria drainage. The Hydro electric potential in Kenya is estimated to be about 6000MW (30,000GWh). Half of this potential is attributed to small rivers. Mt Kenya region has the highest potential of this. It is a conical formation with a base diameter of 65 Km at 6000 ft. The rivers flowing from Mt. Kenya drop on average, 5000 feet in less than 20Km.

The micro hydro- power in Kenya was among the earliest recognized sources of localized energy systems at the turn of the last century. Most of these power systems were used for maize milling, water pumping and in a few cases saw milling. The local traditional water mills used about 100 liters per second and required very low heads of a few meters to operate.

Between 1925 and 1958, several small hydro electric projects were developed such as, Gogo and Selby falls in the Lake Victoria drainage basin, Ndura, MESCO, and Sagana Falls in the Tana River catchment area. The total installed capacity of these plants amounts to 6300 kW.

Micro hydro- power if defined to range between 5 - 100 kW holds a lot of potential in this country. The highlands in the wetter part of the country like the Mt. Kenya, Aberdare, Nyambene and Mt Elgon hold the largest potential. Other areas with considerable potential are the Kisii highlands, Cheragany hills, Kerio and Mau escarpment, and to a lesser extent the Shimba hills at the coast

One study estimated that there are over 100 sites in Kenya which are 25 km from the grid and economically feasible. There are several other sites that can produce less than 10 kW. Some examples of micro hydro activities includes:-

- Brooke Bond Company for example, has been installing schemes since 1920's ranging from 400kw to 800kw in capacity, supplying 50% of their needs.
- The Tenwek Hospital in Bomet (in the Western highlands) has developed a 400 kw unit that was commissioned 1990. Existing information from other countries shows that lowest cost of micro hydro schemes are from locally built units and mainly used for mechanical purposes such as milling. They can cost as low as US$ 200/kw.
- The Kenya Power and Lighting has a number of small schemes

5.4.2 Status of community micro-hydro power generation in Kenya

Community micro hydro- power generation activity in Kenya is low as compared to other countries particularly in Asia. The minimal activity in this area can be explained by the fact that no definite guidelines and policies exist in Kenya due to:-

- Lack of knowledge on potential of micro-hydro power in social and economic development
- Lack of information on costs
- Lack of coherent policies and guidelines on rural energy development
- Monopolies in the energy sector – private entrepreneurs can install and operate only up to 1 MW at the moment.

IT Kenya is currently working very closely with the ministry of energy to develop community micro-hydro infrastructure and capacity in the country. Plans are to give community "ownership" of project by involving them in the planning, installation and management of the pilot schemes. It is anticipated that the pilot project will shed light on:

- Potential of micro hydro in social and economic development in Kenya
- How communities can invest in micro hydro and
- The role of credit organisations

5.4.3 Other renewable Energy Technologies

Kenya has very high adoption of the solar home systems with over 40,000 homes currently with installed photo voltaic systems. This energy is primarily used for lighting, entertainment, communication and battery charging. The sector is currently championed by the private enterprises who sell and install solar home systems in homes. There is very high scope of PV electric systems for decentralised energy in Kenya.

Wind power has only been exploited for water pumping mostly for the high income enterprises or institutions. The activity among communities is low.

Biogas activities are minimal but attract a lot of interested clients. The development of biogas as an energy for communities in the remote areas is hampered by the high initial costs of the systems.

The scope of applying the participative planning guidelines exists in all off-grid power sources existing in the country. This will be elaborated further in this review.

5.5. Assessing the potential for application of the participative planning guidelines in the Kenyan context

** Section below moved to Section 9

6. Peru

6.1. Context

6.1.1. National Context

Peru has a population of approximately 22 million inhabitants distributed over a surface area of more than 1.2 million km² . 70% of this population live in urban centres while the remaining 30% are rural inhabitants. Peru is one of the most centralised countries in South America, as Lima the capital, concentrates more than 7 million inhabitants, or one third of the total population of the country.

The electrification coefficient of the country is currently around 65%, while the rural coefficient reaches only 20%, a clear example of the lack of development in this area, and unfortunately a situation which will be difficult to revert within the short or medium, despite the efforts being made recently.

One of the main problems concerning rural electrification in Peru is the sustainability of the service, due to a series of factors such as: the dispersion of the rural population, the small sized of the systems required, the difficulties in implementing adequate training and Organization schemes, high costs of the implementation due to the difficult terrain.

On the other hand however, Peru has many significant energy resources, both commercial and non-commercial: petroleum, gas, hydro, coal, geothermal, solar, wind, bio-mass etc. Of these mentioned, small hydraulic , solar and wind schemes could play an important role in rural electrification. For example, the country's hydraulic resources are equivalent to 65 000 MW, of which only a total of 2500 MW are in use, that is less than 5%.

The government is currently making efforts to improve the rate of both the global and rural electrification, and it is expected to reach the figure of 75% globally and 40% at rural level by the year 2000. For this, the strategies of the government are:

- Expansion of the coverage by extending the primary and secondary transmission lines.
- Construction of small electricity systems (PSE)
- Promotion of renewable energies (solar, wind)

The government (Ministry of Energy and Mines), through the DEP (Executive Projects Committee), is emphasising the expansion of the coverage by extending the national electricity GRID as far as possible, a costly manner of expanding the electrification process, leading the government to subsidise investment costs and in some extreme cases the operating and maintenance costs.

This expansion of the GRID is being done through the Privatisation Programme whereby investors obtaining the concession of a certain area, have to sign a compromise of investment in which they will implement electricity transmission lines in rural areas as part of the payment for the system conceded.

6.1.2. Chalan : Site of the project

The community of Chalan is situated in the north of the country, at a height of between 2,650 to 2,850 m.a.s.l. in the district of Miguel Iglesias, in the province of

Celendin, department of Cajamarca [5]. The terrain in this zone is highly broken with varying ecological features.

The community of Chalan has a population of 120 families or about 540 inhabitants. The social structure of the families according to the FAO classification are:

- Sub-subsistence families (45 fam), who have scarce resources such as land, water, animals and capital. Many do not have any land at all and simply sell their labour.
- Self-subsistent families (62 fam) who are a little better off, but just cover their basic necessities with their income, quite often having to carry out complementary activities to ensure their basic needs.
- "Surplus families" (13 fam) a small group who have relatively more land, and raise few more animals then the previous families, they manage to sell some milk, and some agricultural products. but their living conditions are also deficient.

The community of Chalan occupies a land surface area of approximately 580 ha., it is also the district capital . Its inhabitants are typical farmers of the Andean highlands. The main activities of the district are farming and animal raising complemented by some handicrafts and, trading, while some inhabitants rent out their labour.

The community has the following services, a medical post, college school, Municipality and a market. The roads are extremely bad and impassable during the rainy season.

With respect to organisational aspects, the Development Committee of Chalan (CODECHAL) was set up in 1989 to promote crop and animal farming, health aspects, irrigation matters and others, leaving the Municipality as the development promoter of the community itself.

These two organisations have been seeking to implement a micro hydro power schme (MHPS) which would have not only provide domestic lighting but also facilitate small scale agro-industrial activities. As a local authority[6], the Municipality is a key decision maker with respect to projects for the community.

Consequently, the Development Committee and the Municipality have joined forces to support the construction of the MHPS, with each Organization contributing its resources, the former mainly the labour while the latter a part of the financing.

6.2. Participation criteria with respect to the installation of micro mhps

The ITDG-Peru Energy Programme has drawn up a proposal with respect to rural electrification, specifying the criteria for participation considering the social, economic, cultural and environmental factors which would provide the base of the programme's strategy to respond to the necessities and behaviour of the rural

[5] The denomination of village, district, province and department refer to the national geopolitical criteria whereby areas are differentiated according to population, resources, services, economy etc. In this case the community is the smallest unit while the Department is the largest.

[6] The Municipality receives an annual allowance from the central government, its decision overules those taken by any organization in the district and poltically represents a group of communities situated within its jurisdiction.

population. This idea does not mean neglecting the urban areas as many problems in the rural zones are the consequences of centralism and therefore the dependence of the former on the rural zones.

The relationship between the components in the work area is permanent in such a way that both the objective population and the field team influence each other. Although **the technological** is the variable in harmony with the environment and the characteristics of the population, these establish the base for the integral planning. The components of the programme promote active participation of the families involved in the project. It is this process of permanent interchange which gives rise to the systematisation as a criteria which registers and capitalises the experience (See Table 1).

Consequently under this integral vision of the programme, the population will participate in each stage of the activities, that is to say since the planning of the MHPS within the community to the final dissemination of the experience once the project is completed. ITDG will accompany the community by supporting or promoting a series of internal circumstances such as: the community manner of working together , Organization with participation of all beneficiaries, working for common benefits, contribution of labour force without monetary cost etc (See Table 2).

One of the most important parts of the participation is the financial aspect of the project. This involves seeking financing from national and foreign entities and institutions to carry out the organisational aspects, training, infrastructure, equipment and machines to fulfil the main objection : the implementation and operation of micro HEMS.

Table 1.

PARTICIPATION COMPONENTS IN RURAL POPULATIONS

ENERGY PROGRAMME COMPONENTS	AREA OF PARTICIPATION RURAL CONTEXT
PROMOTION ORGANIZATION	
	ECONOMIC
	SOCIAL
TRAINING	
TECHNOLOGICAL DEVELOPMENT	TECHNOLOGICAL ASPECT
CREDIT	
	CULTURAL
	ECOLOGICAL
TECHNICAL ASSISTANCE	
SYSTEMATISATION	
DISSEMINATION	

There is a reciprocal relationship between the reality (Economic - Social - Cultural - Ecological) and the components or variables of the Programme.

The technological aspect has a mutual influence with the above mentioned aspects of the area
giving rise to PERMANENT FEEDBACK

Table 2.

PHASES OF THE PARTICIPATION STRATEGY

PROMOTION AND DESIGN

- identification of the work zones
- identification of needs and potential
- technical feasibility study
- pre-evaluation **(participative diagnostic)**
- definition of agreements and commitments: Population and counterparts
- **technical design of the system**

EXECUTION

- participation: population and counterparts
- Financing
- Labour cost
- Materials
- technical assistance
- implementation of the micro MHPS
- technical and managerial training
- commissioning and testing
- **Operation Start up of the System**

FOLLOW UP AND EVALUATION

- strengthening of the Organization
- technical training and management
- supervision of the operation of the micro MHPS
- evaluation of agreements
- **post evaluation**

TRANSFER

- evaluation of the agreement

- evaluation of contributions
- definition of entities which participate in the transfer
- Organization in charge
- **transfer of the property and management of the System**

DISSEMINATION

- drawing up of project reports
- participation in the interchange of experiences at beneficiary level
- systematisation of the project
- **edition of dissemination (video, pamphlets etc.)**

6.3. Experience of the Chalan MHPS : Aspect of Participation

This experience has been important as the execution of the project has involved the participation of local base organisations, local government, foreign financial institutions, NGOs, and local and foreign manufacturers.

ITDG worked with other local and foreign organisations to promote and carry out the project. The participation of the population was of vital importance. DIACONIA, through its promoters, and ITDG participated in assemblies and meetings at community level and opened up a communications channel focusing on the **privileges and benefits provided by electricity its role in development.**

In order to promote participation it is important to consider the following points:

- **Identification of the organisations,** not only to seek a group of organisations but to learn their level of influence within the population.

- **Observation and analysis of the forms of participation,** learn the mechanisms and strategies of working in communal activities (at family level, communal or inter-communal levels).
- **Strengthening of the Organization,** to learn from the experience in organisational work and being able to identify strengths and weaknesses in the operations.

- **Definition of the Organization,** represents the level in which the Organization has received training, new contributions and management instruments through which it can order and promote efficiently the participation of the population.

This group of criterion has allowed the inhabitants of Chalan to fully identify themselves with the installation and operation of the micro MHPS.

6.3.1. The Organization and the beneficiaries

The local Organization developed to the degree that the electrification process became easier to execute. Three different stages have been identified in this development.

The first stage was the setting up of the **CHALAN DEVELOPMENT COMMITTEE** to manage develop and supervise the multiple socio-productive activities in the district. This feature allowed the Committee a wide range of action as its specific work in the design and execution of the project was not greatly significant. The second stage began with the Organization of the **PRO-ELECTRIFICATION COMMITTEE** which was in charge of supervising the work of each inhabitant related to the micro MHPS. Finally the third stage consisted in the setting up of the **CCASEP** (Community Productive Services Administration Committee) which is responsible for the operation, and management of the micro power station.

It is important to mention that the **MUNICIPALITY OF CHALAN** permanently supported the projects with respect to part of the financing and in the aspect of organisational strengthening.

The three organisations depended on each other, that is to say, the first was the antecedent of the second, and the second the antecedent of the third. Consequently

the communal Organization acted as a permanent Co-ordinator and Promoter as it delegated diverse functions to its members with much responsibility and this motivated the future beneficiaries of the electricity in their work, whether in the management or the actual execution of the project.

The presence of the inhabitants of the neighbouring communities of Chalan with respect to making up the labour force also motivated the participation of the direct beneficiaries who were clearly illusioned with the idea of having electricity to light up their homes or to use in small processing activities. A total of 617 families made up the indirect beneficiaries of the micro MHPS and participated in one or another in the implementation of the system.

6.3.2. Types of participation of the population

As mentioned earlier, one the traditions in the community of Chalan is that of shared work in favour of the community and this has been an extremely positive factor in the project. We describe below the different manners of their participation:

- **The work groups,** these consisted of 10 heads of family while the group leader was in charge of supervising the work of each member.

- **Communal work,** where the traditional organisations (irrigation committee, producers, conservationists etc.) contributed a day of work as an obligatory contribution of the inhabitants. This work was related to irrigation channels, road construction and maintenance, farming plots etc.

- **The contribution of the basic services participants** , this was where the students of the district's school and college worked on some lesser physical work (transferring wood, removing earth, carrying stones and similar). The medical post staff and religious congregations also participated by carrying out tasks they considered as important.

- **Contracted labour force**, the Municipality supported this initiative by paying the heads of family daily wages for specific tasks.

In this above manner, the families carried out a total of 4,318 working days, of 8 hours work daily.

6.4. Impact generated

The impact generated by this project may be summarised as follows:

a) In the economical aspect

- The families save a considerable amount of money by using the electricity provided. They previously spent 324 Soles/year using kerosene lamps, 172.80 Soles/year using candles and 183.60 Soles/year using a battery run lamp.

- Generation of income from the payment of the electricity tariff by the 86 permanent users.

- Implementation of small enterprises (stores, welding shops, bakeries) providing new income to the families.

- Creation of 3 new jobs in the MHPS itself (02 operators and 01 manager) with a monthly salary of US$56 and US$ 92 respectively.

- The tariff is US$ 0.09 per kW/hour.

b) In the social aspect

- The participation of the population through different types of Organization (family, group and individual) meant an important contribution in the implementation of the micro MHPS.

- The basic services of education, health and communications have been improved.

- The formation of a management committee has been accepted by the inhabitants in order to guarantee a permanent electricity service.

- The current lighting is much better quality than that of kerosene lamps. Additionally the service is available over 12 hours per day.

- The possibility of studying or working for a longer time is very important for the beneficiary families.

c) **In the technological aspect**

- Local capacity at the level of manufacturers and operators of hydraulic technology has been developed.

- The trained inhabitants manage and maintain the system by following a maintenance programme.

- The population now has a type of cheap, good quality and easily manageable technology.

d) In the ecological aspect

- The project has promoted a non - contaminating efficient technology.

- The installation of the micro MHPS has not affected the local ecosystem as the installations and land area used are small.

- The use of kerosene has been greatly reduced, especially with respect to lighting.

6.5. Sustainability aspects

Drawing on the above mentioned experience and under the framework of participation of beneficiaries in isolated systems such as that in Chalan, the sustainability of the MHPS must involve the following aspects:

- **The participation of the Beneficiaries**, especially the final users, must be permanent throughout the implementation process of the system, that is to say from the first planning stages, up to operating and management phases.
- **The feasibility study**, must be accurate and practical and strictly technical leading to local rural development , free from political influence.
- **Electricity for production,** priority given to the electrification of the communities taking into consideration the productive uses of energy.
- **Reduction of costs,** the optimisation of the resources available at local level, the use of engineering techniques adapted to the conditions of each system all provide a reduction of the expenses of the complementary works.
- **Seeking of financing sources,** which can provide the economic resources, these sources may be private, states or from the beneficiaries themselves.
- **Tariff structure,** the payment capacity of the final users, the local customs with respect to payment for services must be taken into account before setting a tariff which, although meeting the local capacity must also be profitable.
- **Management,** this must be conceived under a business focus, whether private, municipal, communal or mixed**.**

6.6. Lessons

**Section below moved to Section 9 **

7. Laos

Lalith's paper

8. Traditional power supply systems and individual PV-sets in Tanzania

8.1. Rural Electrification in Developing Countries - an introduction

Pasted to Section 2 *

8.2. Examples of community involvement in rural electrification projects in developing countries

Local initiatives to electricity supply are prevalent in all the major third world regions of today, although in Africa the experiences are scarce. World-wide, the co-operative organisation is perhaps the most frequently used form for the local management of decentralised electricity systems in developing countries. Internationally, a major actor in the development of rural electric co-operatives is the *National Rural Electrification Co-operative Association* (NRECA), a US organisation funded through the *US Agency for International Aid* (USAID). In 1964, USAID approved to the world's first international loan for co-operative rural electrification (Colombia), soon to be followed by similar programmes in Nicaragua, Ecuador and Costa Rica[7]. Since then, NRECA has launched comparable programmes in many other countries, especially in South America and Asia.

Even if co-operatives have dominated the recent history of locally managed electrification liberalisation trends result in private firms and shareholder companies becoming increasingly common. Also, power supply projects based on renewable energy technologies, foremost individual PV-sets, have expanded in numbers lately. Given that technical and financial features in PV-projects differ from traditional rural electrification projects, they will be treated separately in this report.

In Bolivia, the US organisation *National Rural Electric Cooperation Association* (NRECA) started rural electrification activities in the 1960's. However, not until a decade later, national initiatives were taken when ENDE launched their first massive rural electrification programme in the 1970's.

NRECA was formed in the US in 1942 and has provided legislative, communications, insurance, management and other services to more than 1,000 rural electric co-operatives which provide electric power to much of the rural areas of the United States.[8] NRECA's guiding principles is to provide safe, reliable power to its consumers at the least possible cost, consistent with sound business practice.

In Bolivia, the co-operative approach has been adopted for rural electrification and the co-operation with NRECA has been close. Prior to the 1960's, when rural electrification programmes started, no significant efforts had been made to electrify rural areas. The current number of Bolivian rural electrification co-operatives is approximately 120. However, privatisation tendencies that affect Bolivia as well as other South American countries have put the co-operatives in a difficult position and their transition into branches of private distribution companies have started in parts of the country. Co-operatives in Bolivia can generate their own electricity or be connected to the national grid.[9]

India has subject to the national rural electrification programme launched rural electrification co-operatives, the idea originating from NRECA's activities in the US. According to the government of India, the co-operative form has been concieved because co-operatives are better suited to meet the special requirements of rural distribution for an improved consumer service, consumer participation and better load

[7] Ross, J. E., 1972. *Co-operative Rural Electrification: Case Studies of Pilot Projects in Latin America*, Preager Publishers, 1972.
[8] NRECA, *The next greatest thing - 50 Years of rural Electrification in America*, p.4.
[9] Gerger Åsa and Gullberg Monica, 1997. *Rural Power Supply with Local Management: Examples from Bolivia, India and Nepal*, SEI 1997. ISBN 91 88714 31 4.

development. Besides this, it is seen also as an organisation that can help co-ordinate other rural development projects in the respective rural areas.[10]

Up to date, there are 37[11] rural electrification co-operatives in India spread over 11 States which are connected to the state grid. They have been closely linked to the State Electricity Boards and their activities have been top-down controlled. Four of them have been in operation for more than 20 years, another 18 are between 10 and 20 years old.

The Indian Government has been planning for some time to liberalise and to bring in private initiatives into the area of electrification. Since 1990 private investors has been given the right to invest in the Indian power sector. The degree to wich foreign participation has been allowed has increased since then, and according to interviews with REC's monitoring chief in 1995, the latest policy allowes for 100% foreign equity participation.

In india there are also GEF-projects implementing power supply systems harnessing renewable energy. Particularly the UNDP/Ministry of Environment and Forests implemented project 'Optimizing Development of Small Hydel Resources in the Hilly Regions'[12] is announced as practising stake holder participation in all stages of the project design and patricipation.[13]

"*The project is designed to assist the Government of India in the optimal utilization of small hydel resources in the Himalayan and sub-Himalayan regions through the development of a master plan and through setting up of 20 commersially viable small hydeldemonstration projects and by up-grading the institutional and human resource capabilities from the national to local levels. By developing a package of appropriate technologies and management practises which are people-centered, the project would demonstrate the potential to reduce deforestation and protect biodiversity in the eco-fragile , besides reducing emission of GHGs. This will be achieves by ensuring the use of electricity for cooking, heating and other purposes instead of fuelwood."*
(GEF, *Quarterly Operational Report*, June 1997.*)*

In Zimbabwe, UNDP and The Ministry of Transport and Energy together with the Department of Energy implements a GEF-project entitled 'Photovoltaics for Household and Community Use'[14]

"The project expands rural use of photovoltaics (PV) while assessing the technology and approaches to its promotion, providing a model for other African countries' eforts at off-grid electrification. The project includes efforts to develop indigenous PV business, co-operation with national utility, and analysis of national policies including import duties." (GEF, *Quarterly Operational Report*, June 1997).

In Nepal , besides the grid based power supply, which is the option covering the largest number of rural consumers, there are numerous mini- and micro-hydro power plants in the country. Shaft power for milling has been harnessed from waterfalls in Nepal for ages. Small locally produced turbines have been used for power generation

[10] Rural Electrification Corporation (REC), *Background material - Workshop on Decentralised Power Distribution Systems under the Auspices of Ministry of power*, Government of India.
[11] An additional co-operative exists but is no longer operational. (REC).
[12] IND/92/G31
[13] GEF, *Quarterly Operational Report*, June 1997
[14] ZIM/95/G31

(sufficient only for the immediate surroundings) since 1984, when the private sector was allowed to generate and sell electricity. Bilateral aid organisations[15] have developed rural power supply systems based on modern micro-hydro plants in selected parts of the country. These systems have generally contributed to social and economic development in the area and often involved the local population in one way or another. Exmples include:

- Salleri Chialsa Electric Company, a locally dominated shareholder company generating and distributing its own hydro power;
- Ghandruk Village Electrification Committee caring for their own generation and distribution of power as part of a nature conservation project in the unique Himalayan massif;
- The Aserdi Users' Organisations purchasing power from a larger company, Butwal Power Company (BPC), in the nearby. BPC in it self has a history of participative planning, where support to its establishment has been given by the international United Mission to Nepal.

In Tanzania, the goverment policy has recently changed towards enabling private inititaives in the power supply sector.[16] While the option of private generation and distribution of electricity was still under development, the Urambo Electricity Consumers Co-operative (UECCO) was formed in September 1993 with legal support from the rural electrification department at the parastatal utility Tanzania Electricity Supply Company Limited (TANESCO), and Ministry of Water, Energy and Minerals(MWEM). The new approach to organisation and management of rural power supply was suggested based on recent SEI/TANESCO studies in Tanzania, revieling that rural electrification activities in Tanzania had reached an financial impasse.[17]

Different organizational set-ups are possible in Tanzania. A private organization or company may be the best choice in some cases, a co-operative solution in others. Combinations can of course also be considered, where for instance the supply is managed by a private company, whereas distribution is managed by a co-operative which buys power from the supplier. The co-operative from is the presently best established in the country, wherefore the pilot project in Urambo was suggested to become a co-operative.

8.3. Experiences of community involvement in rural electrification projects in developing countries

For a community to be truly participating in the planning of its local power supply system, it is ideal if the system is owed and maintained by a locally anchored, official organisation with legal status.

With locally anchored in this context, I mean that local electricity consumers are well represented in the ownership and management structure. Most of the above listed examples of community involvement are based on traditional organisational models such as business practises or co-operative movements. The examples have in common that they aim to develop the local power supply system so as to meet the local needs properly, and to be financially viable. Sometimes, although the local

[15] SKAT, ITDG, GATE (GTZ), FAKT (GTZ), UMN & others.
[16] : Ministry of Water, Energy and Minerals (MWEM), 1992. *The Energy Policy of Tanzania*.
[17] Kjellström Björn et al., 1992. *Rural Electrification in Tanzania. Past Experiences - New Approaches*.

organisation is established for the sake of community involvement, it does not succeed in engaging the local electricity consumer in it.

Non of the given examples have explicitly declared that participative planning methods, such as for example Participatory Rural Appraisal methods have been applied. However, the way PRA is being described by for example Robert Chambers, it is *'...a growing family of approaches and methods to enable local people to share, enhance and analyse their knowledge of life and conditions, to plan and act'*[18], it can be argued all the above initiatives to some extent apply participatory planning approaches. With a stricter definition of participation one can suspect that there are not many rural electrification projects to exemplify it. For example, PRA has predominantly been used in areas such as natural resource management, programmes for women and the poor, agriculture, health and food security.[19]

Local involvement in the project, if realised, tends to result in that the system design is more appropriately fulfilling the local needs, and that capital and maintenance costs can be minimised. These factors are crucial for the viability of any power supply system.

The co-operative form for the local organisation is applied in Bolivia as well as many other south-American countries. Only a few of the Bolivian co-operatives have however managed to sustain and be financially viable. For them that have not, one observed, generic factor is the lack of leadership commitment and the fact that most consumers were not aware of their rights and liabilities as being members of the co-operative. Explanatory factors for poor commitment often include poor or lacking knowledge, or lacking resources. Both Misque and Capinota co-operatives in the Cocha-bamba region of Bolivia have ceased to exist. In Misque, an explanatory factor is the leaders' poor commitment to the co-operative which in turn rendered attendance at public meetings scarce. There was also mis-use of funds and poor commitment to the co-operative activities by the employed staff, etc. In Capinota there was at least a functioning leadership initially, but here as well the poor commitment by the individual consumers, and the co-operative management's inability to invoke it, lead to the organisation soon becoming bankrupt. In Capinota however, the co-operative remains a party in the local community with some influence on the infrastructure planning. Most likely, the Capinota co-operative will mainly devote itself to the agricultural planning in the area. For both these co-operatives there where also other factors contributing to their ceasing, although it appears that the local interest and commitment is fundamentally important. The US' pause in aid to Bolivia during almost ten years affected these co-operatives severely since they where still in the 'training phase'. Also, national tariff policies may have come out disadvantageous for both Misque and Capinota - see further in this report.

On the contrary, the co-operatives that are still functioning, albeit not always profit-making, there has been information campaigns and a more ambitious approach to actually involving the consumers/members in the present activities and future planning. In CRE, which is truly the most flourishing electrification co-operative in Bolivia, much effort has been devoted to the internal communication and consumers involvement in decisions. CRE is huge organisation compared to most other rural electricication co-operatives. The total number of members is 165,500. Alike the other co-operatives, CRE has by-laws stipulating their management framework,

[18] Robert Chambers, 1994, *Participatory Rural Appraisal (PRA): Challanges, Potentials and Paradigm.* World Development, Vol. 22, No 10 pp. 1437-1454.
[19] Robert Chambers, 1994, *Participatory Rural Appraisal (PRA): Challanges, Potentials and Paradigm.* World Development, Vol. 22, No 10 pp. 1437-1454.

annual meetings etc. CRE is following the by-laws. CRE's consumers are all members with right to vote and to become elected. Besides the by-laws, CRE also relies on the Manual of Description of Functions. This manual describes, at the medium level, the functions and attributes of all its main bodies up to the level of the Directorate. At the local level there are District Boards of three members that constitute the voice of the CRE consumers. CRE is profit making and expanding. One of many initiatives contributing to CRE's favourable development is their promotion of income-bringing end-uses of electricity. It is realised through a electric appliences shop CREAGRO in one of the rural branches where, the consumers can purchase for example sewing machines or similar.

The CEY co-operative in the Yungas has experienced both strong and weak management during its existence. I general, the co-operative have followed its by-laws and members have been fairly engaged in the issues of electricity supply. During a period of lacking administrative management, CEY experienced miss-use of funds and a reluctance to raise tariffs in accordance with raising costs. A few years later CEY were in the unfortunate situation that electricity prices had to be raised dramatically, while electricity services were actually poor. Naturally, members tended not to pay their bills promptly, etc. Through, thorough information and a strong leadership, enhanced services and stabilised electricity prices were eventually achieved, and members became more supportive to the co-operative. CEY is (1995) administratively stable, but not profit making. While the Bolivian Government suggests that CEY should be privatised, the co-operative members believe it is preferable to hold on to the co-operative structure. This since it has shown that the co-operative is important also for the planning of other infrastructure and for acting as a conflict-solving mechanism for all kinds of societal problems in the area.

The CEY-management is convinced that information campaigns are important and in 1995 there were two such campaigns on the drawing board. One television information dissemination project with the aim to educate and inform the public about proper use of electricity. The television campaign was suggested to be financed by the consumers themselves, through a fee equivalent to 6 USD per year. Another suggestion, less elaborated at the time, was a campaign informing about the idea behind the co-operative, its objectives and activities. It was estimate that only about 10% of the existing members had a proper understanding of the co-operatives nature.

As well in the private sector, community based projects in Nepal, the importance of information campaigns is highlighted. In an ICIMOD[20] manual on for the sector it is written: *"It is usually necessary to prepare some promotional materials, e.g. posters, calendars. booklets, and reports for various purposes. For example, posters can be prepared and distributed to existing // installations, rural schools, // offices, etc for awareness raising among the local people and to provide a clear contact address for interested clients. Some information booklets or short reports should also be prepared for public representatives, donors, investors, and so on. This type of work could best be undertaken by the central specialist agency or a larger development agency //."*

In Urambo, Tanzania, the Urambo Electric Consumers Co-operative owes and manages an off-grid power supply system. There has at times been lacking communication between the management committee and the members, mainly because the annual meetings were not arranged as stipulated in the by-laws. However, the co-operative is expanding and local people join rather that leave the

[20] International Centre for Integrated Mountain Development (ICIMOD), Kathmandu, Nepal.

co-operative. Part of the reason is most probably that meetings are now held on a regular basis, but also that electricity services have proven to be fairly reliable. Management efforts to involve members in decisions regarding their power supply system include a campaign for lowering the individual loads during the time the co-operative applied flat rates, and later a opinions survey summarising consumers' preferences regarding meters or load limiting circuit breakers. The campaign on lowering loads did not give much result wherefore the decision to install meters or cut-out fuses was taken.

Indian co-operatives have sometimes experienced that the top-down control on them from the REC, and even more the SEBs, have rendered difficulties in motivating the local consumers in decision making processes. This notwithstanding, it is evidently so that the co-operatives have been more successful in reaching their goals than the SEBs. For example, the share of households reached by the services amount to over 50% in the areas where electricity supply is managed by co-operatives, while in SEB managed areas, only 27% of the households are connected.[21]

The power generating company Butwal Power Company (BPC), in Nepal. Have created a form for the local consumers involvement that is not co-operatives but User's Organisations. The power company relies on these organisation for their communication with consumers, and for the billing of electricity services in scarcely populated service areas. The User's Organisations have also helped realise their power supply by contributing labour or in some cases money in the phase of up-building the distribution line servicing them. BPC aim at retaining high load factors in these branches and advocate low-wattage cookers for the households. Also, for the sake of low investment costs, maintained load factor and simplicity, BPC have suggested cut-out fuses and flat rates in these areas. The experiences with load-limiting circuit breakers are however not favourable.[22]

The Village Electrification Committee in Ghandruk is sub-ordinated the ACAP[23]-programme, which applies grass-root management strategies. The Ghandruk Village Electrification Management Committee has 17 members. They meet regularly to discuss the Alternative Energy Programme (ACAP) activities in the village. Mass meetings are also held in Ghandruk, where all members should attend. Most of the people participate, as the meetings are compulsory. During these meetings, the Committee attempts to motivate consumers to electricity productively (for example by encouraging people to establish local industries), and to promote maintenance of a high load factor. They also discuss and try to resolve general problems that may arise.

The Salleri Chialsa Electricity Company, have ensured local anchorage through having local, private people hold 37% of the shares. Also, ad hoc committees have been formed in all sites in the power distribution system. Though these committees are of no legal relevance, they help bridge the information flow between the people and SCECO. Effective utilisation of electricity, company standards (wiring. earthing, etc) and policies, safety measures and other matters are being discussed with the committees.

[21] Minstry of Power, India, 1993.
[22] Dale Nafziger, *Field experience with a peak-demand tariff at the Andhi Khola hydel and rural electrification project*, Energy for Sustainable Development, Volume lll No. 2, July 1996.
[23] Annapurna Conservation Area Project (ACAP).

8.4. Governmental support and external assistance required

Financial viability is crucial for any power supply system. Minimising costs and maximising revenues are the obvious recommendations. The high costs and poor revenues from rural electrification projects are major factors contributing to national utilities or large scale private power companies not always prioritising these areas. It is quite expectable that the local management and community involvement facilitates to achieve better systems design in terms of installed capacity being appropriately scaled and load factors kept high, more complete revenues collection, and more income bringing uses of electricity. This should be enough an argument for the national policies to encourage and support different local management models.

Of paramount importance for the local organisations is that the national policy for rural electrification in general and the role of local participation in particular is very clear and consistent. It is important that the government allows for electricity tariffs to be se locally, and in congruence with actual costs. However, this in principle implies that as well the national tariffs must be set so as to cover costs. Situations may otherwise occur where the local organisation can not invoke its consumers interest in contributing loyally to the soundness of the local system, but rather claim that they are being put at a disadvantage by the government. Examples where this might have occured are Misque and Capinota in Bolivia. In Tanzania, this is not presently a problem for Urambo, since there is at date no realistic option to generating own power. It is a latent problem in the country though. If the government due to its equity policy interferes with tariff setting, it is recommended that the co-operative consumers are provided the same subsidiaries as other electricity consumers in the country (compare for example with India).

It is further obvious that most locally managed power supply systems will need direct, external support. Both technical, financial and most often managerial support is required, normally for a few years at least.

For most power systems, be it off-grid with own power generation or a distribution system supplied from a national grid, the different kinds of support must be closely linked and co-ordinated. The costs to be financed are highly dependent on the systems design and consumption patterns in it. To reach financial viability in a power system, it is important to control the power development and make adequate reinvestments and expansions. It is important, in particular for a system with own generation, to maintain a high load factor - so that capital investments are utilised optimally. With this in mind, it is clear that managerial and technical support need be co-ordinated with the financial.

From the experiences with Urambo in Tanzania, the following recommendations are made by the SEI and TANESCO team[24]:

<u>Technical and administrative support</u>
The technical expertise required for design, construction and operation of a local transmission and distribution system, including a grid connection or a local power plant is not available in the newly formed electrification cooperatives. The need for technical assistance is therefore obvious.

The technical assistance required should be expected to include:

[24] Gullberg M. et al*. Local Management of Rural power Supply in Tanzania, Experiences from the first pilot project in Urambo*, SEI - in process.

- Pre-feasibility study with tariff estimate;
- Feasibility study with more accurate tariff estimate;
- Design study with specification of equipment to be purchased and construction work to be done;
- Purchase of equipment;
- Construction work;
- Commissioning;
- Training of operators;
- Maintenance and service support;

In Tanzania the national utility, TANESCO, will be able to provide this assistance. Even if other solutions are possible, there are advantages with engaging TANESCO for this. If this is done, compliance with national standards is more easily achieved.

Administrative support will be required for:

- Formulation of by-laws for the cooperative;
- Organisation of the management of the operation;
- Organisation of book-keeping;
- Auditing and independent monitoring.
- Formulation and negotiation of agreement with the supplier of electricity (when appropriate);
- Formulation and negotiation of maintenance and service agreement (when appropriate);

For all but the last two tasks, TANESCO will be able to provide the assistance for the pilot projects. When TANESCO would be supplying electricity and/or maintenance and service, an independent body should assist the cooperative in the negotiations. A suitable organisation in Tanzania that could assist with this needs to be identified.

It is recommended that the government of Tanzania should consider formation of an Advisory Board for Rural Electrification Cooperatives, ABREC, with the expertise required to give technical and administrative support to new and existing cooperatives. This Board could also be given other responsibilities as outlined below.

Financial support

The investment required for establishment of a local distribution grid and either connection to the national grid or installation of a stand-alone small power plant can be substantial. Local conditions will influence the size of the investment, but table 1 below gives a reasonable indication:

Table 1 Total investments in a village electricity distribution system (after 4 years)

Number of consumers	340
Investments for distribution	
Distribution and service lines	305
Distribution transformers	180
Meters	55
Subtotal	**540**

In addition to this, there will be an investment for either grid connection or a stand alone power plant. The investment required for grid connection will be about 400 kUSD for a sub-station plus 20 kUSD per km of transmission line. For a village located 80 km from the national grid the investment for grid connection will amount to about 2 MUSD. A stand-alone diesel power plant will cost about 700 USD/kW. A capacity of 500 kW, which should be adequate during the first 4 years will require an investment of about 350 kUSD.

The initial investment distributed on the connected consumers after 4 years would then be as shown in table 2.

Table 2 Initial investment distributed on connected consumers (after 4 years in operation)

Option	Cost per consumer (USD)	Cost per additional consumer (USD)
Grid connection:		
Distribution	1588	
Transmission line	5882	
Total	7470	515
Diesel power plant:		
Distribution	1588	
Power plant	1029	
Total	**2617**	**1500**

The investment in the diesel case is comparable in magnitude to the investment required for a small single phase diesel generator set of 2 kW which could be an option for an individual consumer[25]. In both cases however, the marginal investment for additional consumers is much less. The centralized option therefore becomes more economic as the load and the number of consumers increase.

If full recovery of the capital costs is required from the start of the supply, the centralized supply will obviously be un-attractive for the individual users, who will either install a small individual generator set or limit their electricity use to light for a few hours and use a PV-system.

Financial support will therefore be necessary for the investments required in a rural electrification system. Experiences so far from the first rural electrification cooperatives in Tanzania indicate that the initial members are prepared to make a financial contribution of at least 40 USD each. With 100 initial consumers, 4000 USD will be collected. If the District Council is able to contribute the same amount, about 99% of the initial investment must be financed from other sources.

[25] A diesel generator set of 2 kW from Yamaha costs the equivalent of about 2600 USD in Sweden. The specific fuel consumption of this generator set is 0.45 liter/kWh at full power.

It is possible that a sufficient number of consumers are prepared to contribute more, but even if the contribution could be increased to 400 USD, most of the financing must be found outside of the cooperative[26].

Financing could be provided from funds collected by a surcharge on electricity sold in the national grid or from international donors. In order to keep tariffs below the level where individual diesel gensets are more attractive, an initial subsidy in some form will be necessary. Giving part of the initial investment as a grant is one possibility. Tax exemption on equipment imported for rural electrification cooperatives should be considered and also possibly tax exemption on fuel used for rural electricity supply[27]. With tax exemption of fuel, ther will not be a need for subsidies on capital costs.

Proposed conditions for support

The expected rapid increase in the interest to form rural electrification cooperatives in Tanzania makes it necessary to develop policy guidelines for support. The situation may easily become unmanageable if the cooperatives are handled on an ad-hoc basis.

A fundamental requirement for support to rural electrification cooperatives must be that the service can be considered as sustainable. Financial sustainability must be a primary objective. This implies that the revenues must cover the full operating expense and also, in the long term perspective, the full capital cost. Environmental sustainability should also be a long term objective. This implies that there should be a credible strategy for use of renewable energy sources for the generation of the electricity.

Another fundamental requirement must be that the project leads to benefits not only for those connected to the electricity supply but also to other members of the community. This can be achieved in various ways. Installation of street lights is one obvious possibility. Other possibilities are provision of a water supply and electrification of hospitals, health centers, schools and other public buildings.

The following guidelines are proposed for discussion:

1. The cooperative shall be officially registred and have a caretaker committee appointed.

2. The cooperative shall have at least 100 members who have paid a membership fee and a share of at least 40 USD.

3. The District Council shall be a member of the cooperative and have contributed the same amount as the total contribution of the other members.

4. A tariff study, with recommendation for a tariff for year one and two of the operation, prepared by or approved by ABREC shall have been presented to the members. The tariff shall be designed to recover the operating costs (including maintenance and service), investments in meters within 4 years and a reasonable part of the other capital investment.

[26] The accumulated government contribution to rural electrification in Sweden has been estimated to the equivalent of some 300 MUSD.

[27] In order to avoid misuse of tax exemption on fuel, it is suggested that the exemption is based on metered electric output from the generators and the manufacturers data for specific fuel consumption.

5. Each member shall have confirmed his willingness to pay for the service according to the proposed tariff.

6. There shall be at least one street light for each 10 consumers. The District Council or individuals shall have made a commitment to pay for the street lights during the first five years. In case the hospital or clinic in the community is not already electrified, this should be part of the project. There should be a guarantee from the District Council regarding payment of a specified number of electric units for the hospital or clinic.

7. There shall be a credible long term development plan for the cooperative with load projection and a proposed solution for supply from a renewable energy source.

8. There shall be a credible plan for management of the operation, including plans for training of operators, line workers and administrative personnel. In case supply of electricity or service and maintenance will depend on organizations outside of the cooperative, the parties involved shall have agreed to sign the agreements pending the necessary financial support.

9. The cooperative shall agree to hand over all equipment purchased for the funds provided from outside to ABREC in case the cooperative finds it necessary to terminate the electricity supply.

10. The cooperative shall agree to keep technical and financial records according to instructions given by ABREC and make these records available to ABRECfor evaluation on an annual basis.

Organisation of future activities

The initiation and monitoring of the first rural electrification cooperatives in Tanzania has been carried out in cooperation between TANESCO and SEI. These organisations can obviously continue their work and handle at least also the next two projects. It appears as advisable though to arrange for involving, without much delay, the national organisation that shall deal with rural electrification cooperatives in the future. It has been suggested here that this organisation tentatively named the Advisory Board for Rural Electrification Cooperatives, ABREC, shall be independent of TANESCO.

A gradual shift of responsibilities from TANESCO/SEI to ABREC during the pilot projects would allow a natural growth of ABREC from two or three people to perhaps ten within five years.

ABREC could be given an advisory role both to the electrification cooperatives and to the Government of Tanzania. It should rely on the existing infrastructure of TANESCO whenever this would not be in conflict with its role as an independent advisor. This means that much initial data collection as well as initial studies and implementation could be carried out by TANESCO. TANESCO should be paid by ABREC for such services and the costs included in the project costs.

Until ABREC has been formed and is able to take the full responsibility for support to rural electrification cooperatives TANESCO should consider moving the responsibility from the research department to the department of rural electrification.

8.5. Conclusions regarding community involvement in traditional power supply systems

It is clear from the international examples that local people can successfully, and sometimes at a relatively lower cost manage meter reading, billing and regular maintenace of their system. What is more interesting is that the community invovlement provide better opportunities for a rapid load development and in particular the development of income generating uses of electricity. Many local organisations being responsible for the power supply have also contributed constructively to the planning and development of other local infrastructure or societal issues in the community.

Local initiatives to electrification need for their success be assisted by an experienced and fairly impartial organisation. It is crucial for the sustainability of a small power-supplier that it is able to do careful and proper technical planning with respect to the specific preferences expressed by the local consumers. The assisting organisation shall thus not only be technically skilled but also concerned about the welfare of the consumers. Further, it is adviceable that the assisting organisation works along the directives of the national development plan.

Financial support for implementation must be provided. This can be done either as favourable loans or as grants justified by the general rural development programme of the country. The scope in terms of funding and time frame of the external assistance may vary between different projects. A common observation from the international survey is that most locally managed power schemes require several years of external assistance.

Crucial for the smooth handling of assistance to local organisations, let it be technical, financial or managerial, is the existence of an indigenous organisation with sufficient autonomy and a mandate to implement rural electrification. It should ensure that rural electrification programmes are well designed and properly targeted. It should also assists the local enthusiasts in seeking for funds from the government or from donors, and work out training programmes for the local staff.

Appropriate training programmes is another instrumental factor highlighted in the international survey. While it is easy to see that the systems design needs to be directed by an experienced organisation, day-to-day activities appear easier for amateurs to handle. However, common for all the visited organisations is that they underline the importance of training at multiple levels during the period of commissoning, implementation and during the first years of operation. In fact, poor management and inadequate maintenance constitute one of the two most prevalent problems. The other main problem is tariff-setting. A frequent governmental ambition is pan-territorial tariff. Aims in the national development plan to maintain equal tariffs counteract many local and economically self-reliant power systems.

Coordination of power supply with other development projects in the area is recommended. As well important is the information and promotion to local electricity consumers regarding for example security matters. Promotion of income bringing end-uses of electricity is also important.

Last but not least, it became clear from the survey that the sincere interest from the local people to help electrify their neighbourhood is crucial. There may be different approaches to mobilise the people in different societies, but there must be a tangible interest that can be captured in an official organisation with legal status. Further, there need also be a few persons gifted with leadership talents so to overcome

possible internal disputes and to represent the local people in their contacts with donors, banks etc. Although this is not a surprising finding, the need for local support and serious commitment is sometimes overlooked once an help-to-selfhelp-programme has been launched.

8.6. Discussion about schemes for disseminating individual PV-sets

Individual PV-sets are slightly different from traditional systems in that they do not bring about the need for controlling an entire system. Important is rather that each individual set complies accurately with the demand as expressed by the consumer and that the PV-option is a better option for each individual case than any other existing or potential option. If this is the case, what is needed in terms of external support is often the help with financing a relatively large investment.

Significant for the cost for energy from PV- technologies, as well as for other renewable energy technologies, is its large component being capital costs. As an example, a small 18 Wp PV-lighting kit costs USdollar 350 and lasts for about twelve years, batteries and tubes must be changed every third year at an estimated cost of USdollar 78. The regulator must be replaced once, i.e. after six years at a estimated cost of USdollar 100.[28] Fuel costs are of course non. The present value of the total life cycle cost therefore, is divided between 65% capital costs (USdollar 350) and 35% replacement costs (USdollar 192), if employing 10% interest rate.

Although straight forward economic comparisons point out the PV option as the least costly, for many rural households in developing countries the capital investment is beyond their cash ability. Further, commercial bank loans are seldom accessible to the poorest, a major reason being commercial banks requiring collateral security. Notwithstanding, PV's have been successfully spread in a number of developing countries thanks owing to carefully designed financing schemes.

In South Africa ESKOM, the state utility, provides PV-modules for renting or leasing, and cares for maintaining and servicing the systems. This programme aims at reaching households situated beyond reach for grid extension. A similar financing structure can be found in French Polynesia, where a utility owns, installs and maintains home PV-systems. The typical monthly fee for a household is USdollar 8 for a 160 Wp system. This programme was launched in the 1980s with subsidies coming from French aid.[29]

In other places, a community commitment is asked for before PV-systems are designed for or even offered the site. In the Mexican PRONASOL programme, a local electrification committee must be organised , that promises to look after the project. Such organisations seek for approval at the local government. The issue is processed in the state government and - if approved - funded and directed by the federal government. The utility, *Comision Federal de Electricidad* (CFE), cares for designing, local training based on participation and infrastructure development for maintenance and installation. There are two categories within the PRONASOL programme. Productive users include agro-industries and similar applications and are not approved unless thought financially viable. Funding is by loans from the Mexican development banks. The other category for funding is for general life improvement, mostly for households, schools and health centres. These projects are supported by government funds: 50% from the federal government, 30% from the state government and 20% from locally negotiated sources that can be either the local government or cash as well as in kind payments from members in the electrification committee. Both commercial and life quality types of projects rely on the local community developing

[28] J.P Louineau. et al. *Rural Lighting...*
[29] J.Gregory, *Financing Mecanisms for Solar Energy Technlogies*, AFREPREN 1994.

financial means of paying for the repair and maintenance of the system and for possible expansion of the system. Revolving funds is the most common solution that can also help repay the initial loans for the commercial category.[30]

Similarly, in Rwanda *L'Union des Banques Populaires du Rwanda*, a commercial bank was providing loans for PV-systems. The conditions for loans were at least five interested persons per village that each put up with 20% of system costs (approximately USdollar 560 per kit). Following on fulfilled conditions, the bank paid the total cost of the system to the supplying company who then proceeded with installation. The reimbursement of the loans was spread over 12 to 37 months, with instalments ranging from USdollar 14 to USdollar 40 per month and an interest rate of 9%.[31]

The *Global Environment Facility* (GEF) currently finances two major programmes for PV (India and Zimbabwe) both of which emphasises financial self-reliance. In principle, GEF lends money on a revolving fund basis to the two countries. Given the sour experiences from earlier revolving funds, common in the 1960s for agriculture activities (i.e. USAID review 1972), measurements are especially taken to ensure for one, that the money is used for PV's - rather then for salaries to bureaucrats, and secondly, that funds are repaid - i.e. that loans within the recipient country are given only to projects that seem viable.

In India the implementing agency is the *Indian Renewable Energy Development Agency Limited* (IREDA), a Government of India Enterprise. IREDA is specialised in renewable energy technologies and has important knowledge about the local market, such as niches, consumers preferences and consumers ability to pay. Motives for launching the Indian programme include results from numerous government of India and World Bank studies, primarily in 1991 and 1992 , saying that PV lighting and selected other applications were already economically viable in non-electrified areas, but consumer awareness to the benefits of PV had to be developed through more effective marketing and financing schemes. Indian motives for introducing PV's includes also environmental factors and the reliance on imported fossil fuels. The terms of project are that IREDA will re-lend grant proceeds to its clients at an interest rate of 10% for PV-applications, repayable in 8 years with 2 years' grace. Potential consumers include the private sector companies, public sector enterprises, co-operatives and individuals.[32]

The question with PV-systems is rather whether they are really meeting the local demands and contributing to a village's development. The ongoing GEF-project in Zimbabwe has for example been criticised for not applying any participatory planning and not alerting the actual needs and preferences of the local electricity consumers.[33] Especially the fact that energy is provided for lighting only, while other possible end-uses are overseen, is questioned, among others by Mr. Bhekumusa Maboyi, a research associate at the Zimbabwean, Regional Environment Organisation ZERO[34]. He also questions whether the project helps vitalise the domestic solar panel industry, or rather prepares a ground for international dealers.

[30] J.Gregory, *Financing...*
[31] Ibid.
[32] Ibid.
[33] Climate Network Europe, *Getting the Right Mix. Participation in GEF Climate Change Projects*, December 1995.
[34] Bhekumusa Maboyi, ZERO, Zimbabwe, *Technology Transfer Overlooked in GEF Solar Project*, Renewable Energy for Development, December 1995, Vol. 8, No. 4, p. 3. The Stockholm Environment Institute.

With the traditional 415/240 V AC system, where also higher tension can be supplied on request, the only load-limiting factor is the capacity of the generators and the transmission and distribution system. Although lighting and household appliances dominate the load in many newly electrified areas, it is an important feature of the traditional system that industrial electricity use is not countered by the power systems design.

Individual PV-systems that supply 12 or 24 V DC, can readily be used for lighting and powering of some appliances like radios, cassette players, fans, small water pumps and refrigerators which are commercially available for 12 or 24 V DC operation. Some appliances are only available for 240 V AC. Use of these with PV-systems require installation of an inverter at an investment of 1- 3 USD per W capacity (available from ~120 W to ~4 kW).

Technically, PV-systems can be designed to cope with the same energy services as the traditional system. The limitations are financial rather than technical. The cost per supplied kWh will be at least 1.2 - 1.3 USD when a individual PV-system is used.[35] This is significantly higher than the cost for electricity from a diesel generator, which can be estimated to 0.4 - 0.5 USD/kWh. In most cases, PV-generation is therefore financially realistic mainly for those with a small energy consumption, for instance residential consumers requiring electricity only for some basic lighting, a radio and perhaps a small refrigerator.

The supply reliability can be expected to be higher with an individual PV-system than that to be expected in practise with centralised supply from diesel generator sets in rural areas. For some electricity users this might justify a higher cost for the energy service.

The international market for PV-modules is dominated by telecommunication sets, water-pumping sets and sets for 'basic needs' in both households and health care centres.[36] The main advantage over diesel generating sets according to vendors of PV-equipment is the high reliability and, in case of remote and small loads, the low energy price.

PV technologies can also be feasible for pumping water. Water pumping may be for domestic needs or for irrigation. Irrigation has a more intermittent nature than that of domestic water use, and pumps will stand idle for significant parts of the year. Further, for farmers in general, paying ability varies with season. Consequently, although calculations have shown that PV-pumps are cheaper than diesel-pumps for hydraulic energies up to 1000 m3/day,[37] the diesel may be preferred due to its lower capital requirements.

In Urambo, the option of individual PV-sets for lighting has been compared to the option of providing light with a traditional, diesel-based power supply system and incandescent bulbs, fluorescent tubes and CFLs respectively.

The financially most attractive solution for lighting in a village like Urambo is having fluorescent tubes in a traditional, diesel based power system. It can further be

[35] Net import prices assumed.
[36] R. Hill, Photovoltaics: present status and future prospects, Newcastle Photovoltaics Application Centre, University of Northumbria, January 1993.
[37] B. McNelis, Photovoltaics for Developing Countries, In Hilger Adam Applications of Photovoltaics, Bristol 1989.

concluded that the PV-system is financially more attractive than the traditional system with incandescent bulbs. If CFLs are used in the traditional system, a PV-system with fluorescent tubes remains the cheaper option for the higher load case[38] and, while for the lower load CFLs with traditional supply gives a lower annual cost.[39]

[38] The two demands, 5 000 lm for 5 hours and 12 000 lm for 4 hours have been examined.
[39] Gullberg M. et al*. Local Management of Rural power Supply in Tanzania, Experiences from the first pilot project in Urambo*, SEI - in process.

PART III : THE WAY FORWARD

9. Lessons Learned, Conclusions and Recommendations

See conclusions from project reports, from DFID paper and from Kavita & Co.

*** Lessons learned etc from Kenya stuff below***

**.*. Assessing the potential for application of the participative planning guidelines in the Kenyan context*

5.5.1 Introduction

The majority of rural people in Kenya appreciate electric power, including those who have no access to the facilities. This can be seen from the fact that in high potential areas, some families have invested in PVC's and biogas for lighting and operating household equipment under dissemination through commercial basis. Many institutions not connected to the grid depend on electricity from diesel driven generators. A good market for hydro -power if developed by communities would be available in processing of agricultural produce eg. coffee (diesel driven machines are used to crush coffee currently), rice, and extracting oil from sunflower etc.

5.5.2 Defining a community in the Kenyan energy Context.

In Kenya, a community is defined by the physical environment at play on each individual member of the commune. Among other things, land resources availability defines the extent up to which an individual can relate with the community in general. Three categories of communities are identifiable as follows:-

- People with a common interest in energy and within a feasible geographic or limit of extent from the resource. Here the issue is the demand for the energy (power) versus the available potential capacity.
- People joining together to develop energy (power) to sustain a common public need i.e. supplying power to hospitals, dispensaries, schools, public social amenities like social halls or watering a cattle dip using renewable energy .
- In land owned by the government or held in trust and not alienated for any other use, then the community definition will only be determined by the license limitations of the government and the resource defined by the licensing authority. In other words the community becomes a limited factor defined by the availability of the resources and the limit into which the government would like to allow the exploitation of the renewable energy resource.
- The fourth category of a community is recognised as the group of persons clustered together as a unit by virtue of their employment. i.e. Plantation workers in a labour camp, or commercial enterprise workers in a residential setup, within defined physical boundaries.

5.5.3. Definable community interests in a community energy project

There exists a wide range of needs that the power generated could meet:-

- Need for mechanical or shaft power for productive end-uses like grain milling, oil seed processing, battery charging, refrigeration or power for community water supply.
- Power generation for household use or industrial use and social amenities.
- Combined usage for both mechanical and electricity generation is recognised as not only appropriate utilisation of natural resources but also adds value to an energy project in general. For example, during the day when demand for

electricity is low the such an energy source as the micro hydro- power is used for pumping water for community use or driving a directly coupled end-use processor like a mill or oil press. At night when the community requires electricity for lighting then the turbine drives the electric generator.

5.6. Reflections and conclusion

The Participative Planning Guidelines for off-grid electricity, developed in Sri Lanka and Zimbabwe, could easily be applied in the Kenyan context. Participatory approaches have proved successful when working with communities in Kenya, as demonstrated in the two case studies given earlier. These guidelines would work well especially when used with other approaches such as *PRA* and '*PEOPLE* Approach', to establish community needs, options and monitoring indicators, and would ensure community participation. Gender analysis would also be important given the varied cultures in Kenya to establish possible influence of energy projects on women participation.

IT Kenya is currently working very closely with the ministry of energy to develop community micro-hydro infrastructure and capacity in the country. Plans are to give community "ownership" of project by involving them in the planning, installation and management of the pilot scheme. IT Kenya micro-hydro project will borrow heavily from these guidelines.

5.6.1 Participative planning guidelines, Ownership and management of off grid energy projects

The community in general would be the owners and therefore the managers of off-grid power schemes. In Kenya three types of community ownership are recognised:-

- Co-operative societies as defined by co-operative societies act 1977.
  The co-operative movement is very well organised in Kenya. An off-grid energy project, could be one out of many development activities carried out by such co-operatives. These include farmer's co-operative societies dealing in agricultural products such as milk, coffee, tea, timber etc. Some of these have invested in businesses that could act as good collateral for loans with lending institutions. Currently one such cooperative society is piloting with the cooperative bank of Kenya and the Energy Alternatives Africa, a credit system of installing solar home systems.
- Self help associations as defined by Societies act.
- Companies as defined by the companies' act and the articles of association of ensuing company. Limited liability companies corporations or trusteeships are all forms of associations.

One important consideration when forming or using these associations as the avenue for particpative guidelines is the need not to loose sight of the gender issues and women participatory interests of the project at the formative stage.
Local infrastructure exists at various levels from village to location, division and district level to facilitate development with representation by development committees at all these levels. The Government system also has an existing infrastructure under the district development committees to assist in the implementation of such projects. These local level planning and decision making structures could be channels through which off-grid power projects could be developed in the country. Committees could be formed to manage such projects at village level including location and divisional representatives. These would guide the communities in problem identification and identification of options and also link up communities with possible managerial, technical and financial support. The participative planning guidelines would assist in

standardising or formalising the principles applied by the Government structures and those applied by the communities themselves and other development organisations.

Organisational capabilities and structures of the community in their project would need to be fully developed through training, for information/knowledge/skills development. It is generally agreed that locally perceived needs are determined in order to obtain total community support. In fact community participation in all the stages of development determines how successful a scheme would be.

Whereas it is recognised that the communities would be owning and managing the projects, support or backstopping is necessary due to the technical nature of the schemes and the need for financial support or advise. This is vital in two areas:-

- Backstopping on Information/Technical support i.e. tariff structuring, acquisition of credit, choice of financial instruments etc..
- Backstopping on plant components. This is important for the community to get full support on unique problems encountered on the way. I.e. break down of components that cannot be obtained from the local resources.

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*** Stuff from Peru below**

This experience has already provided some lessons which we summarise as follows:

- In the organisational aspect, it is necessary to have greater control over the forms of participation especially with respect to the days of work contributed by each family. This control help judge the individual or group contribution and lead to a fair distribution of electricity in line with the contribution.
- According to the legal framework, the ownership of the micro MHPS has been defined as of the Municipality, due to the co-funding provided by it. This situation has ended up assigning a very important role to the Municipality in the operation, maintenance and management of the scheme. Unfortunately that strong participation of the Municipality in the decisions did not allow the consolidation of the Organization scheme.
- It was not possible to manage the system under a business focus, as the Organization was never registered formally as a **company** but remained a **communal entity.**
- It is important that any electrification project includes an education programme for the future users with respect to efficient use of the electricity, and the costs and benefits of the same. This education process should run parallel to the installation work, consequently on the completion of the micro power station, the users will be able to make the best use of the service.
- The tariffs should basically cover the operating, maintenance and replacement costs. A permanent profitable tariff will obviously depend on the socio-economic features of the users.

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11. Annexes

11.1. The Planning Manuals

Scans/ print outs of manuals so far.

11.2. Process Transfer

Laos/ World Bank adoption of PP process