BizClim

Identification of Best Practices Relating to Renewable Energy Financing and Policy in ACP Countries

Towards a private sector enabling environment

A Facility financed by the European Union through the European Development Fund

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EXECUTIVE SUMMARY

This Best Practice Manual is the result of extensive outreach and analysis conducted to identify the leading state and local-level best practices in renewable energy and energy efficiency programmes in African, Caribbean and Pacific countries. The brochure describes in the region 19 of these best practices, and includes examples of their effective implementation in countries or cities across the ACP region. These include policies, regulations, capacity-building initiatives and financing mechanisms to create favourable market conditions for energy efficiency and renewable energy projects, as well as for their replicability, relative ease of implementation, measured energy savings, ability to offset the need for conventional energy, cost effectiveness, greenhouse gas emissions reduction and to enhance gender equity and job creation.

The selected best practices from across the ACP region will help to share best practice and lessons learned. They are not intended to be a comprehensive overview of all successful, existing policies and initiatives available, but rather a selection of those that have been published and are most applicable to developing countries involved in expanding their energy efficiency and renewable markets. The manual is designed as a tool to share successful programmes and policy models that may be easily replicated or to provide ideas that may be adapted for implementation in other ACP countries.

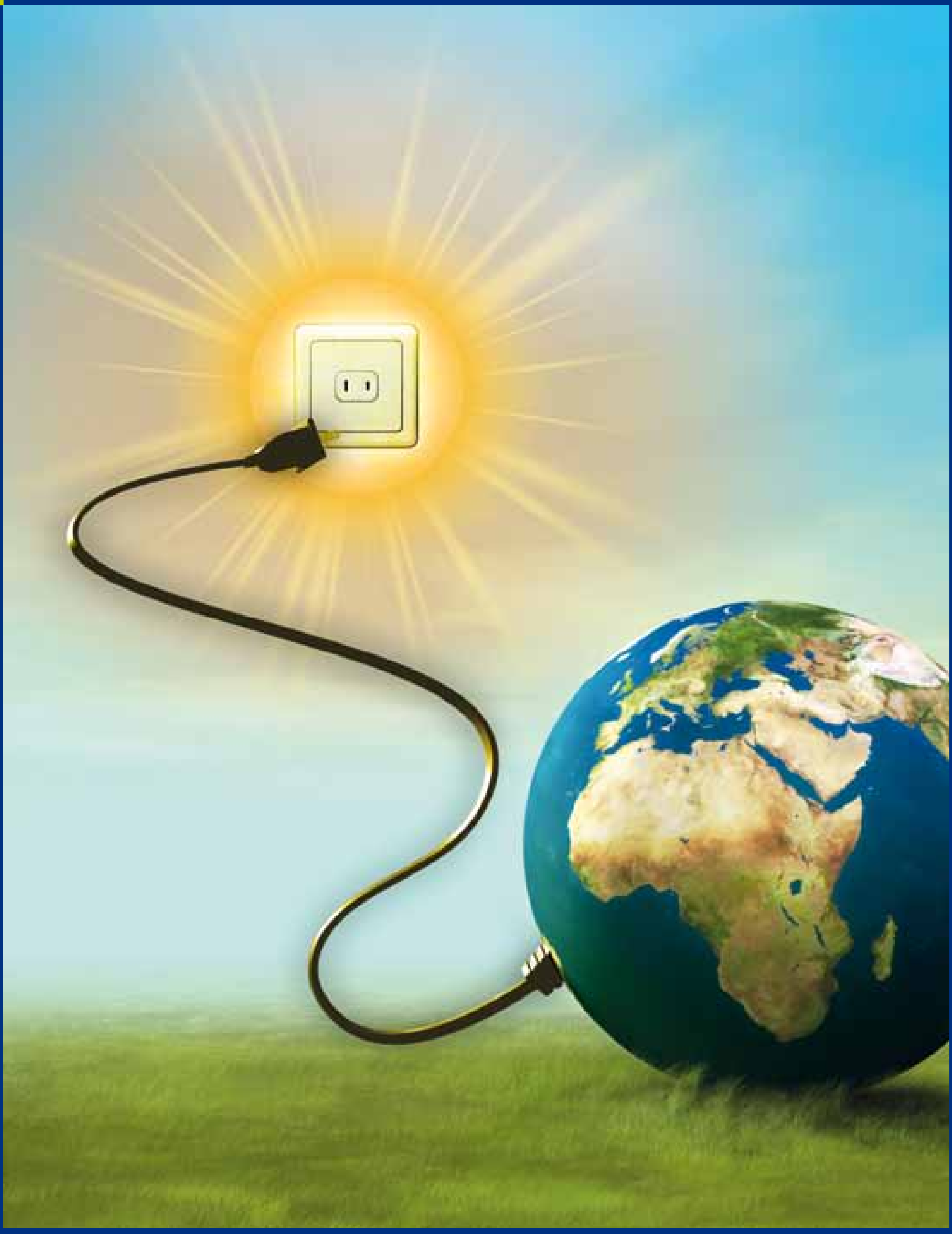
The firs part focuses on energy efficiency resource standards and universal access funds for financing rural or social energy programmes. This first part further discusses institutional-level issues that need to be addressed to ensure the effective and smooth implementation of renewable energy programmes. It also examines quality-related issues which must be implemented to ensure the highest quality standards for renewable energy projects. Finally, it looks at regulations and governance-related issues which need to be considered during the implementation of renewable energy or energy efficiency programmes.

The second part highlights proven and innovative approaches to financing commercial, residential and energy efficiency and renewable energy programmes. It describes financing mechanisms such as government loan programmes, tax incentives and subsidies, performance-based incentives such as feed-in tariffs and commercial methods such as power purchase agreements and the role of both multilateral financial and non-governmental organisations in the financing of renewable energy and energy efficiency programmes.

The third part analyses the steps that have been taken by local governments to make them domestic leaders in innovative and comprehensive approaches to mitigating climate change. Their actions demonstrate a commitment to fiscal responsibility and environmental stewardship.

Finally, it provides an introduction to capacity building measures that should be addressed during the planning and implementation stages of a renewable energy programme, in order to facilitate a sustainable market for renewable energy and energy efficiency programmes in developing countries.

1 INTRODUCTION



1 INTRODUCTION

In response to the increasing stresses of global climate change and energy supply and security issues, nations around the globe are developing innovative strategies for changing the way energy is used. It is at the sub-national level—within states, provinces, cities, and local authorities— that much of this innovation is occurring and many of these strategies are being successfully implemented. These state and local governments possess tremendous power and potential for leading regions, nations, and indeed the world toward a lower-carbon lifestyle. Over the last century, the urban population in developing countries grew rapidly, and the next few decades will further see unprecedented urban growth, particularly in developing countries (UNFPA 2007). More than half of the world's population now lives in urban areas, and almost all new future population growth is projected to occur in or gravitate to cities (UNFPA 2009). This increasing population density adds tremendous demand and strain to outdated electric grids. However, building new fossil fuel power plants is costly and increases greenhouse gas (GHG) emissions to the atmosphere.

Energy efficiency and renewable energy hold tremendous potential to reduce GHG emissions, reduce energy costs, create long-term sources of revenue, improve energy security and enhance gender equity. ACP countries that apply new and creative solutions to create markets for energy efficiency and renewable energy will profit from their numerous benefits. ACP countries have the opportunity to learn from each other in the application of renewable and energy efficiency measures, and a number of key lessons are already being learned regarding innovative and successful energy efficiency and renewable energy practices. An increasing number of countries are using their regulatory authority to forge ahead with dedicated funding and strategic policies that will be instrumental in creating and strengthening the market for energy efficiency and renewable energy.

Leadership may play an important role in proving the effectiveness of new initiatives by testing, incubating, and fine-tuning innovative practices on a smaller scale. Achievements can be demonstrated to other countries and governments to illustrate that a practice can work successfully. This increases the confidence of other governments in the adoption of similar polices or practices. Local governments can also be major catalysts for change, by educating citizens and engaging businesses that can transform the market for energy efficiency and renewable energy. Likewise, state governments can make it easier for local governments to adopt such policies or practices by encouraging national action.

Despite the continuing population growth in urban areas, the majority of the population in ACP countries still lives in rural communities, mostly dominated by women. Women are involved in the majority of both household and income-generating work, where they rely on conventional fossil-fuels for their energy needs. The increasing cost of fuel in rural communities compounded with the effects of pollution leads to a number of ills, such as poor health and low productivity. Access to renewable sources of energy and energy efficiency measures could improve the position of women substantially in developing countries by providing them with new sources of clean renewable energy, technology transfer, and new ways of doing things, which would improve livelihoods and their current position, as well as facilitating sustainable development and poverty alleviation.

It is expected that this Best Practice Manual will promote the sharing of best practices by ACP countries and will result in the accelerated adoption of energy efficiency and renewable energy measures in all ACP countries.

2 POLICIES, RULES AND REGULATIONS

Local markets are essential to sustain significant increases in the use of renewable energy in developing countries. A strong enabling policy framework is required to nurture these local markets. At the very least, this implies an environment where renewable energy technologies do not face unfair disadvantages compared to conventional energy sources. An effectively designed renewable energy (RE) and energy efficiency (EE) policy and regulations can create a sustainable renewable energy market, while poorly designed and implemented efforts have little impact and can result in damage to the cause of RE in the community. As a result, it is very important that that key elements should be considered before government rolls out and implements a renewable energy programme

It is imperative to secure strong political and regulatory support throughout the duration of the programme. Facilitated discussions should be held among key stakeholders to establish the programme's design. The most appropriate lead agency to implement the programme should then be selected. It is recommended that stakeholders reconvene for mid-performance reviews throughout the duration of the programme. Prior to the setting of targets, it is important to plan the goals of the programme, to model its expected impacts and to determine the desired quantity of renewable energy, given the available resources, transmission constraints, interconnection barriers, complementary policies and potential siting challenges.

When determining which technologies are eligible for use towards compliance, it is also important to determine which renewable resources are available and whether existing sources can count towards compliance, which geographic territories are covered and whether central and distributed generation systems are treated differently. Targets should be clear and achievable. Compliance should be monitored and requirements should ramp up periodically to allow for all eligible technologies to participate and be counted.

A programme should be matched to the national policy objectives of the country in which it will be undertaken. National policy objectives might vary from an emphasis on national infrastructure development to an emphasis on hygiene projects, food production, rural electrification or political needs. Where possible, local and regional programmes should fit into the national or regional policy objectives of the area in which they will be undertaken.

Targets can be grouped into tiers for different renewable technologies and/or applications. Tiers are often used to ensure that technologies with higher upfront costs, such as solar photovoltaic technology, receive the same market advantage as the lowest-cost technologies, such as landfill gas, which have a natural advantage in the non-tiered Renewable Purchase Specification (RPS) framework, or to maintain quantities of existing renewable energy generation. An enabling policy environment also requires overarching policies, including establishing a national or regional target or portfolio standard to create necessary signals for investments in the development of RE or EE projects. Policies should also establish a credible and transparent system which is easy for regulators to use. If enforcement rules are too vague or lenient, suppliers will not comply with them, and developers will have little incentive to build renewable energy or energy efficiency systems.

The success of RE and EE policies is also highly dependent on complementary policies such as transmission access and financing. There must be sufficient transmission capacity between load centres and renewable energy resources. Infrastructure expansion policies may need to be drafted and passed to ensure this. Many RE and EE programmes require some level of financial support to ensure that new projects can secure financing. Some projects might require some sellers to sign long-term contracts to reduce financial risks and to make it easier for investors to enter.

Energy Efficiency Resource Standards (EERS)

An Energy Efficiency Resource Standard (EERS) is a government regulatory mechanism that encourages more efficient generation, transmission and use of electricity and natural gas. An EERS ensures that utilities companies adopt energy efficiency as a clean, cost-effective energy resource by establishing an explicit, numerical target for incorporating energy efficiency into the power source mix. An EERS can be used independently or in combination with a Renewable Portfolio Standard (RPS), which requires that a percentage of electricity generation is from renewable sources, or a state may have both an RPS that includes energy efficiency in addition to a separate EERS. An EERS requires that retail electricity (and sometimes natural gas) utilities meet a specific portion of their electricity demand through energy efficiency.

Like an RPS, an EERS is a performance-based mechanism that requires electricity and natural gas distributors to achieve a percentage of energy savings relative to a baseline. A baseline can be the company's prior year's energy sales, an average of energy sales in the preceding two or three years, or energy sales for a specific year, such as 2005.Depending on the state, savings can be achieved through energy efficiency programmes that reduce customers' energy use. Savings can also be achieved by reducing energy waste in a utility company's distribution

Photovoltaic (PV) for irrigation in Baguineda, Mali systems and purchasing energy savings from other utilities or third-party efficiency service providers. The benefits of having an EERS in place include the fact that it creates market demand for energy efficiency which, especially when combined with complementary practices such as tax credits, can boost the local economy by attracting new industries, creating new, local jobs and bringing in revenue associated with energy efficiency projects.

Energy efficiency replaces the need for fossil fuel generation, improving the environment by avoiding emissions and reducing pollutants including sulphuroxides (SOx), nitrogen oxides (NOx), and carbon dioxide. Energy efficiency investments are also significantly less expensive than fossil fuel sources, helping consumers to save money. Energy efficiency programmes can be implemented quickly and begin saving energy immediately. Energy efficiency is the only "resource" that reduces overall energy demand. Reduced demand saves consumers money, and makes renewable energy targets easier and less expensive to meet. It also functions in both regulated and unregulated electricity markets.

For a programme to be sustainable it is important to first secure strong political and regulatory support throughout the duration of the EERS programme. Facilitated discussions must also be held amongst key stakeholders to establish programme design. The most appropriate lead agency to implement the EERS should then be selected. Utilities companies may be in the best position to implement energy efficiency programmes because they have an established relationship with consumers. However, third-party administrators or state agencies have also successfully been used in a number of states. Planning should be undertaken to determine the level of potential energy savings available through energy efficiency in each sector. It is also imperative to determine the method that will be used to measure and verify energy savings under an EERS. Targets

Example 1: South Africa's Power Conservation Programme (PCP)

South Africa's electricity system will be under pressure for a number of years to come. With the effects of the economic downturn appearing to be wearing off, electricity consumption levels are rising again. These increasing demand levels, coupled with uncertainty on when these levels will stabilise, have led to a situation where demand-side management has become essential. The Power Conservation Programme (PCP) is the key government initiative designed to provide a demand-side solution to the energy challenges facing South Africa. As the only quick solution available, it aims to close the supply-demand gap in the short-term, until new base-load stations come online. PCP has two central elements:

1. **Energy Conservation Scheme (ECS)** to reduce energy consumption by approximately 10%;

2. **Electricity Growth Management (EGM)** to manage new electrical connections in line with the available supply of capacity.

The ECS is an interim solution that transfers responsibility for a consumer's energy management from Eskom, South Africa's electricity generation and supply company, to the consumer. It represents a refinement and simplification of work done previously under the National Electricity Response Team – NERT. It caps the amount of electricity available per large power user. The main aspects of the ECS include: (i) A "Normalised Reference Consumption" per customer must be agreed; (ii) An equitable and realistic savings target to close the remaining energy gap must be determined; (iii) Scheme rules must be refined and agreed, including decisions on the enabling legislation (Electricity Regulation Act or Energy Act), exemptions, allocation management, excess charges payable, what happens to the excess charges payable, etc.; (iv) An allocation management system, allowing inter-company allocation balancing and bilateral trading, needs to be put in place;(v) Preparation must be completed to enable the scheme to be "switched on" at short notice, should it be required.

ECS roll-out began with a voluntary phase to allow customers to achieve savings and implement energy efficiency measures. A consumer receives a monthly energy allocation based on their consumption over a reference period, adjusted with a savings target. This energy allocation is the amount of energy that the consumer may consume. If a consumer exceeds this monthly energy allocation, excess tariffs are charged. The aim is to discourage excessive usage. The consumer is able to decide for themselves how to reduce energy consumption and meet their energy allocation. Overall national energy savings targets will also be set. Industry-specific savings targets may also be set, based on the ability of each economic sector to reduce consumption.

The **EGM** strategy prioritises new connections requiring 20MVA or more of power. A balanced scorecard approach will be used, where projects will be scored based on their contribution to the broader economy. Other alternatives – for example, an auction-based approach – are still under consideration. EGM policy has not been adapted by NERSA, the national energy regulator, so for the time being, Eskom has decided that no connections can be deferred at this stage. A National Medium Term Risk Mitigation (NMTRM) Project Team has been established with the support of government, business and Eskom. The NMTRM team is mandated "to ensure there is sufficient planned reduction in demand and additional non-Eskom generation to avoid any form of power supply rationing or curtailment in the constrained period from 2010 to 2016." The team comprises various electricity industry stakeholders, including government, energy-intensive users, business and Eskom. The required risk mitigation solutions are only possible with the total commitment and involvement of all key stakeholders and with a dedicated project team.

do not need to be high in order to be effective. Setting lower energy efficiency targets in earlier years allows energy efficiency programmes to slowly develop as utilities gain experience, although targets must be set at levels above those that would have been undertaken in the absence of such a regulation.

Targets should increase over time to allow for expanded programme development, adoption of new energy efficient technologies and long-term energy savings. EERS policies should establish a credible and automatic non-compliance accounting system that is transparent and easy for regulators to use. Payments are generally made to a state's energy fund, which finances energy efficiency efforts in the state. If enforcement rules are too vague or too lenient, electricity suppliers will not comply with the EERS.

Universal Access Funds

Universal Access Funds (UAFs) for the development of renewable energies are mostly to be found in utility sectors such as water and rural energy electrification schemes. Its application in the renewable energy sector should be explored further. A Universal Access Fund is used to provide a cohesive strategy and long-term funding for national energy programmes. It is most commonly supported by a small, fixed fee added to customers' electricity bills each month. It allows countries to address key technical, regulatory and market barriers, such as emerging technologies or up-front installation costs. A variety of renewable energy and energy efficiency programmes can be funded through this mechanism, including direct incentives, research and development, business development, funding for renewable energy projects, rural electrification projects and public education programmes. UAFs are typically collected from customers of investor-owned utilities. Once the charges are collected, programmes can be administrated either by a state agency or by a third party.

There are a number of options for the operationalisation of UAFs. These include the Investment Model, the Project Model and the Industry Model. The investment model uses state loans and equity to provide initial investment in clean energy companies and projects. The project development model directly promotes clean energy project installation by providing production incentives and grants or rebates. The industry development model uses business development grants, marketing support programmes, research and development grants, resource assessments, technical assistance, consumer education and demonstration projects to facilitate market transformation. They are commonly supported by a small, fixed fee added to customers' electricity bills each month. Surpluses may be carried forward from a previous year to help maintain consistent funding levels and protect against the diversion of funding to other state needs.

A number of best practices for the implementation of a Universal Access Fund cover the administration of the fund, portfolio of activities, target-setting and monitoring, funding sources and transparency. Firstly, it is important to solicit the opinions of interested stakeholders on the design and administration of the Fund throughout the planning process. A utility company,

Example No 2: South Africa - Regulatory Support for Solar Water Heating

From 1973-1983 the Government of South Africa supported the promotion of Solar Water Heating (SWH) with the Centre for Scientific and Industrial Research (CSIR), which developed effective communication strategies and projects to motivate home-owners to install it. Home owners would pay for the installation, either with a home improvement loan, or through cash. The SWH market grew mostly among middle-to high-income customers. In 1983, about 27,000 m2 of solar collectors were produced. In that year, the SWH communication project of the CSIR came to an end and the market collapsed.

In 2003, a White Paper on the Renewable Energy Policy of the Republic of South Africa, prepared by the Department of Minerals and Energy, gave a new perspective on the issue and created renewed interest in the field. The city of Cape Town took the initiative to support RE and to ensure that 10% of its households had installed SWH systems by 2010. To this end, it initiated a number of activities to promote the technology, such as drafting a bylaw to promote SWH systems, to retrofit low-income homes with SWH systems, and so on. As a result, the SWH industry in the country is currently experiencing a revival, and the media have begun covering the industry extensively. A further project, the SESSA (the Sustainable Energy Society of Southern Africa) installed subsidised SWH and collected data for assessment of the technology.

At an SWH workshop held at the International Conference on the Domestic Use of Energy in Cape Town in April 2007, Eskom, South Africa's electricity generation and supply company, presented its new approach to solar water heating and its inclusion into Eskom's Demand Side Management Programme. In June 2007, the Eskom Board approved the investment of R2 billion to be made over five years. This has had a positive impact on the industry, and has contributed to a shift towards increased use of SWH for space heating and hot water use in South Africa.

In South Africa, the Central Energy Fund, a government-supported company managing the future energy needs of the country, subsidized the installation of 500 SWH systems with funding from the Global Environment Facility and UNDP in the first half of 2007. In each of South Africa's three major cities - Johannesburg, Durban and Cape Town - 165 systems were installed. The project was advertised in the newspapers, resulting in a positive demonstration effect, renewed customer interest in SWH and support to the SWH industry.

The White Paper and its subsequent implementation accelerated the commercialization of solar water heating in South Africa, thereby transforming the market and reducing the use of electricity and fossil fuels for heating water.

state agency or third party must be selected to administrate the fund to ensure that investments follow the programme's goals and represent public interest. If legislation is required to implement the systems benefit charge, draft legislation should be developed for the consideration of Parliament. Programmes supported by the UAF often include support for both emerging and technically proven technologies. The state's energy goals should first be identified to determine what kinds of incentives are required. Balanced portfolios include programmes for technical assistance, load management, rebates, grants, loans, equity and subordinated debt investments and business development grants. There should be a degree of flexibility to respond to changes in markets by creating new or modified programmes.

Furthermore, the programme should have measurable, monitored targets, such as infrastructure development measured in MW of new capacity and energy savings. This may be difficult to accomplish if using an industry development model. Funding sources should be kept consistent from year to year. Excess annual contributions should be allowed to carry forward to the next year, especially when the programme is being established. Mechanisms should be set up to ensure consistent funding levels and to prevent funds from being allocated to other state needs. Proper legislative language and public acknowledgement of the Funds benefit would help to mitigate the misallocation of funds. Last but not least, State officials, office holders and the public should be made aware of the Fund, how it is being allocated, what types of technologies are eligible to apply for the funding and what the application procedure entails. An annual budget should be established for the fund, specifying eligible technologies and clarifying disbursement procedures and other eligibility criteria.

Institutional Framework

The institutional framework covers a wide range of issues, including the role of government, the legal framework, market barriers, technical capacity and the role of the private sector. Market forces and government programmes both play their part in promoting the adoption of renewable energy resources in developing countries today. However, widespread opinion across a broad range of actors recognises a clear need to strengthen the institutional framework in support of long-term market development and the deployment of RE and EE to global rural communities in particular.This requires the adoption of a lifecycle approach and a re-emphasis on the provision of a sustainable service. In the past, too many RE projects have resulted in early system failure with inadequate provision for rectification. Consumer disillusionment and negative press have been the natural consequence of such incidents, to the detriment of the wider adoption of renewable technology.

To prevent these unfortunate occurrences at the institutional level the, issues that must be addressed are:

- Regulation and the Public Authority: The positive role of public authorities and the regulator is significant, yet requires further development in practice;
- How to create an enabling environment for the key roles of end-users or end-user groups, the service provider, and the independent facilitator to act as mutually supportive agents;
- Project lifecycle (in the context of either the open market or government-sponsored programmes), and in particular the need to develop provision of:
  - After-sales services through service providers;
  - Consumer awareness programmes and mechanisms to empower consumers, either individually or through the facilitation of consumer groups;
  - Standards and accreditation schemes to ensure appropriate system quality, installation and maintenance personnel;
- How to define the role and harness the value of NGOs.

As demonstrated in the case study below, the establishment of a long-term sustainable renewable energy market in developing countries depends primarily on successfully building an appropriate infrastructure framework with distribution, financing, installation and an after-sales structure. Once an institutional and financial framework exists within which a sustainable market can be established, this will in turn offer assurance to end-users. When governments, donors and utilities install grid power systems they make sure that they have the means to operate, maintain and regulate them – this is equally relevant to renewable energy and energy efficient systems. All forms of electricity generation require financial resources, management, and operational structures. A good example of remedial action taken at the institutional level following system failures is that of Kiribati, as illustrated below. In this case, the result was a more successful photovoltaic deployment programme.

In South Africa, off-grid PV has been provided to schools

Example No 3: Photovoltaic (PV) Rural Electrification in Kiribati

Kiribati has a population of just 80,000 people, spread over 33 dispersed islands in the Pacific Ocean. Although the government has focused on the electrification of the country since independence, only some vicinities of its capital area have yet been electrified. Kiribati is located in the centre of the Pacific Ocean and has an abundance of solar energy resources. Other renewable energies such as wind or hydro are not usable. Therefore, the Kiribati government decided to adopt photovoltaics (PV) for rural electrification.

The first attempt to introduce PV nationally dates back to 1984, when the Solar Energy Company (SEC) was established by the Foundation of the Peoples of the South Pacific (FSP), using USAID funding. SEC was formed as a private company and carried out the sale and installation of PV systems and their components. Technical training for SEC staff was carried out with the cooperation of the UN Pacific Energy Development Programme (PEDP) and the South Pacific Institute for Renewable Energy (S.P.I.R.E). At first, this plan appeared to work. About 270 Solar Home Systems (SHS) were sold to private customers and some larger systems were sold to government facilities. However, PV sales fell lower and lower every year, and in 1989 SEC almost went bankrupt. Despite this, the government, which was responsible for SEC, still had a strong will to develop PV rural electrification. It therefore requested the Pacific Islands Forum Secretariat's Energy Division to fund a survey of all PV purchasers in order to identify the reason for the decline in PV business.

From the survey, the government found that almost none of the PV systems were properly maintained. The average lifetime of those systems was less than three years. The purchasers' dissatisfaction was widespread, resulting in a very negative reputation for PV, followed by a dwindling of PV sales within a few years following the project. This meant that the cash sales approach was not sustainable in Kiribati, and following the recommendations of S.P.I.R.E, the government and SEC decided to adapt the PV business model from sales-style to utility-style, or ESCO (Energy Service Company). Although the first attempt was a failure, this experience led Kiribati to succeed in PV rural electrification several years later. In 1990, the Japan International Cooperation Agency (JICA) carried out a study on implementing renewable energy programmes in the South Pacific, and as a result of the study, JICA and Kiribati agreed to carry out an institutional programme on PV rural electrification in the country. This time both JICA and Kiribati placed a strong emphasis on implementing a sound institutional structure for ESCO-style PV electrification, as a result of the experience of SEC's near bankruptcy. Only 55 SHS were installed in the unelectrified villages of Kiribati's capital island of Tarawa, but the management system was deliberately and carefully implemented.

At first, this approach hit some minor problems. Batteries ran dry because the field technician had neglected his duties. Village elders sometimes requested the field technician to share the collected fee for other public use according to their traditional custom of "give and share". Some families were deprived of their systems because of outstanding fee payments. These problems occurred in the first two years of operation, and were all resolved with the cooperation of SEC, users and JICA. Based in these experiences, SEC gained valuable know-how, including the importance of ensuring the selection of the most appropriate candidates as field technicians. The selection of older people (over thirty years old) with a high enough position in the community to be able to carry out their job against older men, was prioritised over the selection of younger men, who were well able to absorb technical knowledge but were not able to address the community issues due to a lack of status. In this respect, the institutional aspect is shown to be very important in creating a sound management system. After several systems were actually transferred, no further outstanding payments occurred. After seven years, all of the systems now work well, and the management system also works as planned. Most batteries came to the end of their useful life, and were all replaced under the supervision of SEC using the collected fee.

Example No 4: Labelling system for household appliances in West Africa

The West African Economic and Monetary Union (Union Economique et Monétaire Ouest-Africaine, or UEMOA) is an organisation of eight fast-growing West African states. The pace of development in these countries has resulted in them facing electricity shortages. Energy efficiency (EE) measures offer an opportunity to cut peak loads, and the EE labelling of appliances is one of the most cost-effective tools in the hands of governments to promote this. Due to the limited resources available at national level, it made sense to establish a solid framework for EE appliance labelling at the UEMOA regional level, first establishing a voluntary programme that individual countries could then implement and begin to enforce. The main aim of this project was to assist with the establishment of a regional UEMOA EE labelling scheme for household appliances, including air conditioners, refrigerators and lighting.

The project reviewed the international labelling programmes for household appliances and assessed all existing national frameworks with the intention of replicating EE labelling best practice in the UEMOA region. It also aimed to estimate the potential energy savings and GHG emissions reduction to be achieved, based on data gathered from member countries. The proposal also aimed to design and validate a voluntary EE labelling programme for household appliances whilst identifying potential technical laboratories in the UEMOA zone that could be candidates for testing household electrical appliances. A further aim was to organise and hold training programmes and consultative workshops to build capacity in national standards bodies and Ministries of Energy.

The project is expected to lead to a voluntary labelling programme for implementation in each UEMOA member country by relevant bodies, and to help government to quickly enforce EE labelling regulations at the national level. National standards bodies, Ministries of Energy and relevant government agencies were also expected to train for the introduction of EE appliance labelling. Further to this, the project intended to lead to an agreement amongst exporters, distributors and dealers to participate in voluntary EE labelling and to result in a reduced volume of imported second-hand household electrical appliances, which would help to reduce GHG remissions in the region.

Example No 5: House Appliances & Equipment

For African households with electricity access, refrigerators and TV can represent more than 60% of their electricity consumption and for African rural households without access to electricity, the overriding energy use is in cooking, which can represent more than 80% of their energy usage. Good experiences of energy efficiency in Africa include the following:

- Establishing labelling programmes and energy efficiency standards for lamps, refrigerators, room air conditioners, water heaters, etc. – in Ghana, the labelling and minimum energy performance standards for imported and sold compact fluorescent lights (CFLs) and room air conditioners have been mandatory since 2005, and standards are planned for household refrigerators);
- Promoting high-efficiency cooking stoves to replace inefficient biomass traditional stoves and/or promoting fuel substitution of traditional biomass use. In Senegal, there is strong penetration of liquefied petroleum gas (LPG)-fired cookers and other household efficient stoves "Jambaar & Sakanal" using charcoal and kerosene, as well as improved biomass cookers in rural areas to replace the traditional open fire stoves. In Ethiopia, there has been promotion of clean-burning biomass for cooking and baking in the domestic sector "Gonzie & Mirte" stoves, and more than 1 million improved stoves have been disseminated over the past four years;
- Establishing modern distribution systems to facilitate household access to modern fuels such as natural gas, LPG, kerosene and coal briquette, such as in Ethiopia and Senegal;
- Promoting domestic energy shops for the commercialisation of stoves and cooking fuels, such as in Burkina Faso, Ethiopia and Senegal;
- Facilitating access to small loans for potential efficient-stove users, in order to enable them to purchase the stoves, and providing microfinance loans to manufacturers in order to develop their businesses;
- Harnessing the global carbon markets to secure financing for the GHG emissions avoided by the use of clean-burning stoves, for instance in Ethiopia. There are prospects for pilot projects in this field in other Eastern Africa countries, such as Kenya, Uganda, Tanzania and Zambia;
- Implementing local manufacturing of EE appliances and equipment, such as in South Africa; and to a lesser extent, encouraging and supporting local manufacturers of EE cooking stoves, such as in Burkina Faso, Ethiopia and Senegal;
- Promoting solar systems (home and community PV, dryers, water pumping, water heaters). In South Africa, solar water heaters were initially promoted by ESKOM, but the government is now considering the establishment of a national strategic framework for all interested stakeholders in order to develop a large national SWH programme with national targets. PV solar systems and SWH have been implemented on a small scale in Senegal and Kenya;
- Establishing energy performance test standards and measurement laboratories.

Appliance Standards

Appliance and equipment standards help countries to meet energy policy objectives while lowering energy bills for consumers and reducing energy-related emissions. Such standards are a way to formalise a preference for and to increase the demand for equipment that uses less energy. In countries with appliance and equipment efficiency standards, sales of equipment using more energy than the stated standard are prohibited. Such regulatory standards limit the growth of national energy consumption and become cornerstones for meeting national greenhouse gas (GHG) reduction goals. Whilst the initial purchase price for a more efficient appliance may be higher, the cost, energy and carbon savings that result from appliance efficiency standards far outweigh the increased cost price.

Demand for energy-efficient products increases when a policy of higher standards is adopted. When countries lead by example by establishing such rules, they provide a credible, proven example that can pave the way for future policy development in this area. The ban on the importation of old refrigerators in Ghana, for instance, is an example of such leadership. Such standards limit the growth of national energy consumption and are cornerstones for meeting national GHG reduction goals. The Government of Ghana also aims to introduce a ban on cars which do not meet certain environmental and emission levels in the next two years. Since 2003, Jamaica has made it a policy to only allow the importation of used cars which meet emission standards in the country of origin. This prevents the dumping of old cars which do not meet environmental standards either in the United States or the European Union.

It is important for local governments and consumers to understand the two main costs associated with appliances and equipment: firstly, the initial purchase price; and secondly, the lifetime energy costs to operate the equipment. Whilst the initial purchase price for a more efficient product may be higher, the cost, energy and carbon savings that result from appliance efficiency standards are enormous. As older, inefficient appliances and equipment are replaced with newer, more efficient ones, the demand for electricity goes down, reducing peak demand and improving electric grid reliability while delaying the need to build costly new power plants. Adopting a policy of higher standards increases demand for more energy-efficient products. This helps to move the market towards innovations that often include improved equipment performance.

The African transport sector also has great energy inefficiencies, and accordingly there is much to be done to enhance energy efficiency improvements in this sector. Due to the rising costs of fuel, as well as severe and chronic power shortages, many African electricity utility and power service companies are now looking for ways and means to cut their energy costs and to become more efficient, as a way of improving their electricity systems. By strategically building energy efficiency into operation and maintenance planning and management, most of these companies may thus increase cost savings, raise productivity, and improve their competitive edge in the energy market. The implementation of the following measures in a number of African countries was aimed at offering suitable solutions for meeting the growing electricity demand in a cost-effective way.

For the many African countries that are experiencing severe power shortages in particular, energy efficiency improvements in the electricity sector would bring timely and opportune relief through the significant reduction of electricity demand in the peak period.

Example No 6: Transport

- Promoting efficient and effective use of alternative fuels to reduce oil consumption. In Ghana, commercial transporters have switched from the use of fossil fuels to compressed natural gas;
- Promoting fuel efficiency labelling, such as in Nigeria, where there are plans to introduce this labelling for various types of vehicles;
- Establishing labelling for new vehicles and plans for the promotion of electric vehicles, such as in South Africa, where there is now a challenge to make this mode of transport viable on a large scale;
- Improving the quality of transport infrastructure, introducing urban planning, modernising public transport and promoting rail and waterway transport modes and improving the traffic management system. In South Africa, new mass transport modes have been introduced, and in Senegal, new taxis and buses are in use;
- Prohibiting the import of old and inefficient second-hand vehicles, such as in Senegal;
- Establishing fiscal measures for cars and motor fuels, such as the South African tax on more inefficient vehicles based on their emissions.

Quality Assurance

Many previously implemented renewable and energy efficiency programmes can be considered to have failed as a result of a lack of consideration of quality assurance aspects, which aim to achieve installations of the highest quality, providing a greater chance for the medium- to long-term success of a programme. Quality assurance measures must be implemented during all programme phases, with the system being verified to ensure that it meets the relevant specifications. It must be ensured that all components used are of sufficient quality; that the workmanship of the installation work is of an appropriate standard; and that regular on-going maintenance is sufficient to ensure a long working life of the systems. Quality assurance aspects must be worked through in detail at the planning stage of a programme. If they are implemented as an afterthought, there are likely to be deficiencies in areas which are too far progressed to allow rectification, and the programme may therefore be tied to a design or equipment of inferior quality. The project will also be more costly overall, as any problems and deficiencies identified will have to be rectified, probably necessitating additional site visits as well as potentially new or additional equipment.

In order to maximise programme benefits, quality assurance aspects must be designed into the overall implementation process. Quality assurance for a renewable energy programme should broadly follow the same principles as, for instance, quality management systems in manufacturing industries. All processes should be documented in detailed procedures. As procedures are followed, all activities should be documented and the results of any tests performed should be recorded. An independent auditor should check the records periodically and verify that procedures are being followed correctly.

The following example illustrates this principle in the context of a renewable energy programme. For instance, it may be decided that a percentage of each major item of equipment should undergo testing prior to installation in the field. A test procedure should describe exactly the tests to be performed. All test results should be recorded, together with the serial number of the item tested. This will allow verification of the test by an auditor at a later stage.

Quality PV Systeme in Kenya

The purchase of an amorphous silicon module purely because it is physically larger (for a given power) is not uncommon in Kenya, according to anecdotal evidence.
This is typically because rural households: (i) have very small savings and little opportunity to access credit, and if they do it is usually at high interest rates, and (ii) are not well enough informed to be able to compare the relative performance of different module brands, and therefore rely heavily on the recommendations provided by dealers.
In the case of Kenya, thousand of rural households have been unfortunate enough to select seriously under performing photovoltaic (PV) systems and have lost most or all of their investment in what is often the most expensive durable good they own. The existence of low quality systems and/ or low quality installation may discourage future potential SHS customers.

Example No 7: Quality Assurance in the South African Solar Home System (SHS) Market

An important role of quality assurance in a World Bank funded project can be found in South Africa. The whole technical specification for the solar home system components (module, controller, DC/AC inverter and DC lights) was called 'the World Bank Standard' by the PV companies involved in the project. This became one of the major advantages for the PV companies qualified to the standard competing against others in the SHS market in South Africa. Prior to the project, there had been no regulated or comprehensive standard for SHS in the market. As the public lacked awareness of SHS quality issues, the market competition was based mainly on price. As a result, the quality of the systems was neglected and unreliable PV systems were destroying the confidence of the consumer market. The system standard and test procedure have greatly improved the PV systems' quality and are clearly essential to the creation of a long-term and sustainable SHS market.

Procedures should allow for rectification of any issues identified in the first test. In a practical project, it is normal that things go wrong from time to time. However, it is important that any shortcomings and deficiencies are noticed and documented, and that there are mechanisms in place for them to be rectified during the project. Where appropriate, responsibilities can be split - for instance in installation and commissioning - which means that a second person verifies the quality of the work carried out by the first. For example, a subcontractor may carry out the installation. Once installation is complete, the contractor's representative carries out a number of commissioning checks and system tests, recording the results. Any problems are noted in a snag or punch list, and the installer then goes to the site again and rectifies the problems. Lastly, it is essential to implement some form of independent audit to ensure that procedures are followed correctly. This is vital, as people are likely to 'cut corners' for a number of reasons, such as pressures to finish on schedule, cost savings, adverse weather conditions (e.g. heat, rain), or just laziness. Audits should ideally take place during implementation, in order to improve ongoing processes where necessary, as well as following the programme.

Regulations and Governance

Policymakers, regulators and citizens across the world are grappling with the challenges of providing access to clean, reliable and affordable electricity, and addressing major environmental challenges including climate change. Improved transparency and public participation in the development of policy and regulation can help to manage trade-offs between environmental, social, and financial considerations, and as well as identifying points of convergence of these public interests.

The initiative is based on the assumption that policymakers, regulators, politicians, companies and citizens across the world are attempting to deal with the challenge of guaranteeing access to electricity in a stable and financially sustainable way whilst simultaneously addressing environmental problems such as climate change. It is our understanding that one way to help meet this challenge is to contribute to the improvement of governance in the sector, which requires increasing transparency and public participation in the definition of policies and regulations. Transparent and participatory governance can help to establish a balance between environmental, social and financial aspects and to identify points of convergence between various public interests. Obstacles to achieving social goals and sustainable development can be understood – and overcome – differently when studied with governance in mind.

Electricity grid extension to a school

Example No 8: Quality Assurance in the PV Electrification of Rural Schools in South Africa

Whilst many South African cities and towns are fully developed, with modern infrastructure and energy services, a large number of people in rural areas do not enjoy the benefits of being connected to the electricity grid. The South African government, together with the electric utility company Eskom, are working on extending the grid in rural areas. In parallel to this grid extension, PV is being used to electrify schools, clinics and households, mainly in areas where the grid would be least economical. The project was funded by the European Commission and implemented by Eskom. The objective of the project was to provide electricity to 1000 schools in remote areas of Northern Province and Eastern Cape Province, using PV systems. As part of the PV systems, each school was to receive electric lighting and audio-visual equipment. The electric lights would be useful in extending study hours, especially during pre-exam periods, but also during the day on rainy days. Electric lights would also allow adult evening classes to be held in the evenings, under the country's Adult Basic Education and Training (ABET) programme.

Eskom had developed procedures for both the testing of equipment and the installation and commissioning of systems at the beginning of the project. About one year after the start of the project, the Technical Assistance Unit (TAU) had been contracted and had commenced its activities. Part of the TAU's remit was the ongoing monitoring and evaluation of the project. During the initial months of the TAU's activities, serious shortcomings and obvious technical problems became apparent, including a lack of quality control in equipment selection and approval, procedural shortcomings resulting in a variable quality of systems in the field, and variable levels of training for installers and users. Existing procedures had either proved inadequate or sometimes had not been followed at all. The results were evident in the high number of system failures in the field, with the long-term implication of higher operating costs or premature system failure. In addition, analysis of feedback from the field indicated that theft and vandalism occurred to a much larger extent than previously realised, and were becoming a threat to the success of the project. Upon the TAU's recommendation, the Department of Minerals and Energy called an internal mid-term review to address the identified problems. During the review, these issues were dealt with by the TAU in co-operation with Eskom and other stakeholders. Over a period of several months, design improvements, component matching and component testing were carried out, and a number of quality assurance processes were improved. To facilitate this, the TAU produced procedures for component checks, for battery storage and regular recharging, for installation, and for more detailed commissioning checks. Eskom and installation subcontractor staff were then trained in using the new procedures.

The basic principle of the quality assurance mechanisms put in place during the review was to follow documented procedures, and to record the results of all tests and checks carried out. Any shortcomings were recorded, to be rectified prior to completion of installation and handover of the systems. The TAU carried out spot checks as part of its audits, to ensure that procedures had been followed correctly. Before the end of the TAU contract, it carried out a set of final audits to check whether systems had been installed and commissioned correctly, applying the relevant procedures. It was found that the technical quality of the installations had improved greatly between the initial schools visits and the final audit visits. However, significant problems still remained at a number of schools at the time of the final audit. Due to delays in the installation process, the TAU contract ended several months before installations were complete, with significant numbers of installations still to be completed. Therefore, by the end of the project, a large number of installations had been completed without any technical audit mechanism in place.

The delay caused by the mid-term review enabled the project stakeholders to address a number of sustainability issues before the end of the implementation process, such as end-user training, long-term project responsibility, stakeholder involvement and maintenance.

Example No 9: Improving Electricity Governance in South Africa

The main aim of the project was to improve electricity sector governance in South Africa by building government and regulatory capacity to implement legislation to promote renewable energy, energy efficiency and social welfare, in line with sustainable development and public interest objectives. The main activities and outputs covered by the project included convening a coalition of civil society groups, regulatory commissions, government legislators and utility regulators to research and analyse existing governance structures in the sector using the indicator toolkit developed with the Renewable Energy and Energy Efficiency Partnership's support to identify weaknesses in policy and regulatory processes in South Africa. The project also engaged legislators, governments and regulators to address these weaknesses through the assessment process. Learning from best practice in Asia, the project informed policy-makers and regulators in South Africa about building political support for renewable energy and other efficiency-related programmes through open and transparent effective governance. Furthermore, the proposal aimed to identify leverage points to influence regional integration in the Southern Africa region for the promotion of renewable energy, efficiency and public sector interests.

A number of lessons were learned from the execution of the project. These included the need to open up processes for clarifying energy policy for electricity provision and the associated planning roles and responsibilities, through an inclusive national discussion between all stakeholders. There is also a need to clarify the role and authority of the Regulator in energy policy formulation, planning and regulation, including with regard to access and affordability, environmentally sustainable and low carbon choices and economic development. Regulators should also be provided with adequate resources to enable them to fully develop and implement their social responsibilities, such as ensuring access to affordable and sustainable energy supplies and electricity services, and meeting environmental mandates. Parliamentary bodies should take their responsibilities to exercise oversight authority seriously, in order to hold the executive accountable for the development and implementation of a policy of equitable and affordable access to electricity and sustainable energy security.

Governments were also recommended to ensure a sustained and inclusive engagement to build mutual confidence between government and citizens. Reciprocal respect is vital if urgent and fundamental social and environmental needs are to be confronted and backed by a coherent vision and an effective plan of action. Governments must also demonstrate a commitment to rural electrification. Intervention efforts by Government must include financial matters such as subsidies, tariffs, domestic taxes, value added taxes, utility grid connection regulations and standards and safety and quality. Public authorities can also be a sound source of investment in research and development and in the establishment of product manufacturers and producers. There is also a strong case for the provision of subsidies to support rural electrification and/or rural public services (such as drinking water facilities, lighting for administration, education, health centres, and refrigeration). Governments will need to assess whether the state should provide these services or whether they should create incentives for the private sector to do so.

3 FINANCING SOURCES AND FISCAL MECHANISMS

Renewable energy plans can contribute to national policy objectives in a variety of ways. However, renewable energy plans are only one piece of the policy puzzle. Government objectives to achieve economic growth should also take into account fiscal measures to encourage and develop sustainable businesses, such as tax incentives, low-interest loans, development assistance, import quotas, export assistance, government investment, capital rationing, agriculture controls or assistance, transportation infrastructure development, communications infrastructure development, as well as a variety of other policy tools. As with any development planning, paying attention to the big picture is vital if sustainable success is to be achieved.

Loan programmes or microfinance schemes can help customers to overcome the financial barriers associated with renewable energy installations and energy efficiency improvements by spreading costs over a period of time. They can be a better alternative to private lending agreements as they often provide lower interest rates, more favourable terms and lower transaction costs; however, they can also be more complicated and time-consuming to secure. Loan programmes can be administered by a third party such as a microfinance institution, government agency or a utility company, either directly or by partnering with private lenders. Loan rates and terms vary by programme and are sometimes determined on an individual project basis. They can be managed as a revolving loan fund, a self-replenishing pool of capital created upon the programme's inception. The fund revolves as payments from borrowers are returned to the capital pool and then lent to other borrowers.

Programmes must be designed and adjusted to meet market objectives. For example, if the state programme is trying to encourage certain clean energy technologies, the interest rates on those targeted technologies should be lower, or import taxes could possibly be removed on these technologies. Interest rates should be below those of commercial lenders, with a long repayment term (at least 5-10 years), and should incur only minimal fees. Programmes should have an easy, concise application process, with quick loan approval. Loan programme staff should be knowledgeable about renewable energy and energy efficiency in order to be able to properly evaluate and underwrite loan requests and provide good objective information on each project's feasibility.

Loan programmes should include mechanisms for tracking the details of programme use, costs, and energy savings or production for programme evaluation and improvement. The loan fund should closely monitor projects throughout the lending cycle, construction and operation, in order to anticipate and solve problems. There should also be coordination with other local programmes and relevant stakeholder groups to build programme awareness amongst potential borrowers and lending partners.

A long-Term Commitment

In order to discourage the use of bilateral and multilateral aid money to support the industry, a PV manufacturer should demonstrate a long-term commitment to market before being awarded major supply contracts. This is also vital to facilitate access to replacement compenents. A programme to electryfy 1 000 schools in South Africa with PV systems in 2000 saw a large order placed with a manufacturer. One of the conditions of the procurement contract was that the company had a local representation. The company eventually opened a local office in September 2000. The programme ended in March 2002 and company closed down their offices in May 2002.
The avaibility os spare parts seriously affected the success of the whole programme.

Government Loan Programmes

National governments that have received overseas development assistance (ODA) from large multilateral or bilateral development banks in turn allocate these funds directly to specific projects. In addition, most developing countries have created development funds of their own through taxes or tariffs. They apply these funds to rural electrification projects within their own borders. Beyond traditional financing, national governments can also provide incentives to offset the cost of development projects, such as tax and customs exemptions on equipment and VAT exemption on bills. Commercial sources can also be interested in financing electrification projects through loans and equity investment. Commercial sources include banks, both those located in the project host country and international banks, as well as investment co-operatives and international insurance agencies with an investment arm.

Tax Breaks in Senegal

In 1993, Senegal established a law stating that certain PV equipment would be exempt from value added tax and import duty. This included a solar PV "lighting kit" (18 Wp maximum), solar lamps, solar PV "pumping kit" and PV modules.

Sources : Best Practice Manual, UNDP/ESMAP, 2004

National Development Funds

Many developing countries have also created funds for rural electrification projects of their own. They may raise funds through special tariffs on existing electricity customers, by placing a surcharge on energy services, or by earmarking a specific portion of the national budget to the fund. Mozambique, Kenya, Madagascar, Senegal, and Zimbabwe are just a few of the countries that operate national fund programmes for rural electrification. Such funds are an important source of financing support for PV and other related renewable energy projects. 80% of development financing is done on a domestic level. Depending on the constraints of the national programme, project-level developers may be able to receive loans or grants through the national development banks to offset project costs. Beyond national electrification funds, local government policies can also provide significant reductions or refunds on the costs of renewable energy or energy efficiency projects. Some governments provide end-users with tax rebates on the cost of renewable energy equipment, which reduces the overall cost of the project and facilitates end-user involvement. Some governments waive import duties or put in place policies which decrease or offset the cost of carrying out a renewable energy project in that country. Project planners should research the following potential fiscal policies in the project host country, factoring the existence or lack of these policies into the cost of the project.

Subsidies – Subsidies can take two main forms. Firstly, local governments may refund a portion of the cost of a renewable energy system to end-users or to project developers. Secondly, local governments may provide a direct grant to developers to assist them to market, sell and maintain these systems.
Tax breaks – Tax breaks can provide end-users with financial relief when purchasing new equipment by removing taxes on the purchase, or can provide projects with financial relief in procuring supplies or equipment.
Import Duty Relief– Local governments waiving import duties on the imported components of a renewable energy system can represent a significant financial saving for a renewable energy project. Government fiscal policies such as subsidies and tax and duty relief can start up a project, or can direct interest to countries and/or regions where renewable energy would otherwise be difficult to implement. However, problems can arise when, due to a change in government or economic conditions, these tax breaks, import duty waivers or subsidies are suddenly withdrawn.

Example No 10: Establishing a Pacific Micro Energy Services Company on Solomon Islands

Cash, a precious resource in the Solomon Islands, runs through villagers' hands as quickly as it is received. Saving money is virtually unheard of, bank accounts are unusual and borrowing is rare, especially for individual families. Under these circumstances, installing new solar power units can be a daunting challenge. However, a team of renewable energy developers working for SOPAC, the Pacific Islands Applied Geoscience Commission, have developed an unusual scheme that enables these communities to access renewable energy, such as solar.

The team developed a unique new financing mechanism that has the potential to be applied in rural communities across other developing regions. Villagers make a small deposit on the cost of a solar LED lighting system prior to its installation, which is a prerequisite to joining. This allows farmers without access to the traditional banking system to trade cassava, dalo, bananas and other crops as instalment payments to pay off their micro-loan for their solar home systems. It also enables real savings in fuel costs.

The project enhanced the role of women in the communities, as they no longer have to walk long distances to purchase kerosene and other fossil based fuel. With access to new sources of new clean energy, they were able to invest more time in other income-generating productive ventures and in providing quality care to their families.

Commercial Loans and Financing

While all sources of financing will look for sound business plans and low risk, this consideration is most significant in the commercial sector. Commercial lenders will generally only invest in companies that have proven high growth and profit potential and/or that have arranged appropriate guarantees. Commercial banks have several advantages over ODA and national funding. Firstly, commercial sources are flexible and can respond quickly to changes in the international or local economic environment. Commercial loans also follow a predictable application and approval process with which most developers and project managers will be familiar. While commercial lending institutions may make subjective decisions, they are less prone to political change and politically-motivated limitations on financing categories than multilateral development banks and bilateral agencies.

Finally, commercial sources are open to proposals from private project managers, in contrast to ODA sources, which are generally only open to national host governments. Although they may be more risk-averse than government, multilateral, bilateral and NGO agencies mandated to provide development funding, commercial sources are also generally more flexible and accessible than official development financing sources. Programme developers need to be aware, however, that commercial loans generally have a much shorter pay-back term than loans from ODA sources. Terms of more than a year are long by commercial standards. Additional challenges are a lack of understanding of the technical applications involved in renewable energy projects on the part of banks or private investors, as well as the difficulty of assuring rates of return for these applications. Consequently, commercial lenders who are willing to accept these uncertainties and make a loan often charge relatively high interest rates. The likelihood of securing commercial loans or investment is higher if the investing

Example No 11: The Kenyan Photovoltaic Market Transformation Initiative

In October 1996, the Global Environment Facility (GEF) Council requested the International Finance Corporation (IFC) to appraise and implement the Photovoltaic Market Transformation Initiative (PVMTI). After an international review and analysis of a short-list of six countries, the IFC recommended investment of PVMTI funds in three countries: India, Kenya and Morocco. The PVMTI was launched by IFC as an innovative investment facility designed to provide finance in private sector projects to encourage the market development of PV.

The principal aim of PVMTI is to accelerate the sustainable commercialisation and financial viability of PV technology in the developing world. PVMTI aims to address market barriers by making appropriate financing available and stimulating business activity. A total of USD $25 million of GEF funds was made available for investment by the IFC in PV projects in the three selected countries. The funds were allocated by country: $15 million was allocated to India and $5 million each for Kenya and Morocco. Following two years of planning, the PVMTI was launched by the IFC in June 1998 after the implementation plan was endorsed by the GEF, the primary funding agency. The duration of the PVMTI programme was 10 years, from 1st July 1998. The first investment was approved in September 1999 and by December 2000, six more business activities had been approved.

PVMTI Kenya has to date received 23 proposals for investment from a range of commercial companies and financial institutions. The proposals all involved the consumer as the ultimate owner of the PV system, incorporated a consumer credit scheme and involved multiple commercial partners. Quality issues and technical guidelines were provided to investee companies through a workshop on certification of PV training activities. The first PVMTI approval in June 2000 was a USD $1 million loan and grant to the Kenya Commercial Bank Ltd (KCB) to enable them to provide consumer loans for the purchase of fully installed and maintained Solar Home Systems (SHS). Technical support in terms of supply, installation and maintenance was provided by Solagen Ltd, a local distributor for BP Solar.

The second PVMTI investment was approved in August 2000 for a USD $600,000 loan for the Muramati Tea Growers Savings and Credit Coorperative Society (SACCO), who provide loans to their members for the purchase of SHS. Muramati's membership is mainly drawn from the tea farmers in the central part of Kenya. The technical partner for the scheme is ASP Ltd who source PV systems/components from a variety of recognised suppliers of PV modules and balance of system components. A third project recommended for approval is a further USD $1 million loan and grant to KCB which is to on-lend to SACCOs, who will provide loans to their members for the purchase of SHS. Negotiations are still underway on a number of other projects. Success of PVMTI in Kenya lies in providing finance to commercial banks, SACCOs and other financial intermediaries who can provide consumer loans for SHS to a wide customer base in rural areas of Kenya.

Example No 12: FIT Policy Supports Renewable Energy in Uganda

Until recently, Uganda's main source of power was the Nalubaale and Kiira 380MW hydropower dam complex at the mouth of Lake Victoria, with an effective generation capacity of about 230 MW. However, this favourable situation changed drastically in May 2005, when Lake Victoria water levels dropped to their lowest levels since 1951. The poor hydrological conditions have led to a substantial decrease in hydropower output from about 230MW in 2005 to a low of 138 MW in 2010. In 2006, peak demand reached 380 MW resulting into persistent rolling blackouts at peak of 80-120MW. The shortfall in electricity supply has been met through a combination of measures including procurement of emergency diesel and heavy fuel generators, promotion of energy efficiency and renewable energy. The enactment of the Renewable Energy Policy in 2007 marked a major milestone in the drive to promote renewable energy. The policy envisages an increasing share of renewable energy from 4% to 62% by 2017. In addition to additional power generation from mini-hydros, sugar companies have demonstrated the potential to step up generation from bagasse and sell surplus power to the grid. It is now expected that by 2013, sugar companies will be selling up to 50 MW to the grid - equivalent to 20% of total grid electricity supply. In 2007, the Electricity Regulatory Authority (ERA) announced feed-in tariffs for hydropower plants of less than 20 MW and the bagasse-based cogeneration for a three-year period (2007-2009). A well-designed FIT policy and clear FIT guidelines have proved an effective instrument in promoting cogeneration, particularly in the sugar sector.

The ERA is responsible for receiving and processing applications and issuing permits and licences for generation, transmission, distribution or sale of electricity and for prescribing conditions and terms of licences, including prices. Uganda enacted a new electricity act in 1999, which provided for the unbundling of the vertically-integrated government-owned utility into separate businesses for generation, transmission and distribution. Under this arrangement, policy-making remained the role of government, while licensing and tariff setting responsibilities were transferred to an independent regulator. Under the Electricity Act, the regulator is obliged to carry out its function in an independent and transparent manner. Electricity tariffs should be set at levels that recover all the reasonable costs incurred by licensees, including a reasonable rate of return. The Electricity Act also provides for a 'single buyer' form of market structure. This arrangement has created market certainty and reduced the risks of low and politically-driven tariffs, thus attracting independent power producers (IPPs) in generation. The 'single buyer' model type of market structure had guaranteed a market to the generators for the electricity that is produced, and a standardised power purchase agreement has been developed for renewable energy projects. In addition, Uganda has enjoyed a stable and predictable regulatory environment.

In April 2001, **Kakira Sugar Works Ltd (KSWL)** submitted a downsized plan to the Ministry of Energy and Mineral Development to supply 7 MW of electricity to the grid on a 24 hour basis. Based on the demand-supply forecasts and the planned construction of Bujagali, Government was willing to commit to a Power Purchase Agreement (PPA) for peak hours only. Given that the sector was already unbundled at this time, KSWL entered into a tripartite contract with Uganda Electricity Distribution Company Ltd (UEDCL) and Uganda Electricity Transmission Company Ltd (UETCL). The PPA was subsequently signed between UETCL and KSWL in 2003 with an energy purchase price of US$0.049/kWh. In 2007, KSWL and UETCL signed a second PPA to export 12 MW to the grid at a tariff of US$0.0615/kWh. KSWL has been pushing for a higher tariff of US$0.11/kWh, which is closer to the avoided cost of electricity supply, and in May 2010 Government issued a directive to increase the price for bagasse cogeneration to US$0.08/kWh.

Kinyara Sugar Works Ltd also submitted a notice of intended application for generation of 7.5 MW for their own use and for sale to the grid in 2006. The company was awarded a generation and sale license in 2007. The company is currently supplying up to 2 MW in an islanded mode due to interconnection problems. The existing distribution line, operated by Umeme Ltd, is experiencing low voltage problems. The Uganda Electricity Distribution Co. Ltd, which owns the distribution assets, has provided funding for the purchase and installation of capacitor banks to solve the low voltage problem in the grid.

The Ugandan FIT policy is proving a powerful instrument for the promotion of low carbon renewable energy development in Uganda. The policy has contributed to giving renewable energy investors a guarantee for a reasonable rate of return on their investment, positively contributing to energy supply security in Uganda. The major global environmental benefit associated with this policy is its contribution to the reduction of greenhouse gas (GHG) emissions by supporting private sector participation in renewable energy expansion in Uganda. Uganda's experience shows that a FIT policy can be a useful incentive in driving private sector investment in renewable energy investment. A predictable regulatory FIT regime has ensured that new entrants are guaranteed a market for their power to the national grid – however, it is also vital that a FIT policy is supported by favourable long-term financing models.

organisation has been involved in financing development projects before. Finally, renewable energy projects financing levels are often low by commercial standards, thus discouraging some commercial banks from considering investment because their administrative cost ratio in comparison to the principal is usually high.

Feed-In-Tariffs

Feed-in tariffs (FITs) are an effective policy tool for driving the large-scale development of renewable energy. FITs are one of the most widely used renewable energy policies worldwide, and are beginning to be adopted at the state and local levels in a number of ACP regions. Under a feed-in tariff, utilities guarantee to pay renewable energy producers a fixed price payment for the electricity they produce over a fixed period of time. Contracts generally run for 20 years and are designed to allow the producer to generate a reasonable return on investment.

FIT design depends entirely upon a government's policy objectives. Payments are generally determined in one of three ways: (i) based on the cost of levelized renewable energy generation, awarding payment levels to ensure profit on renewable energy investments (the most common and successful choice for FIT policies around the world); (ii) based on the utility's avoided costs, either in real time or based on utility projections of long-run fossil fuel prices; or (iii) offered as a fixed-price incentive, sometimes arbitrarily established without regard to avoided costs or to project costs, and sometimes based on an analysis of these factors.

Example No 13: The Tungu-Kabiri Community Micro-Hydropower project in Kenya

Hydropower is a major source of electricity in Kenya, contributing well over 60% of the country's electricity. In 2007, the government passed legislation allowing Independent Power Producers to operate in the market. However, the act didn't take into consideration small-scale decentralised schemes, such as micro-hydropower, which could be used by off-grid communities. As a result, private sector investment in renewable energy businesses has been slow. Despite this, a micro-hydropower project located in Tungu-Kabiri in Meru South District, approximately 185 km north of Nairobi, has been in place since 2000 and generating electricity since June 2001. The capacity of the scheme presently amounts to 14 kWe. The scheme is owned, operated and managed by a community group that has incorporated itself into a corporation, with a membership of approximately 150 members.

The project was funded through the UNDP/GEF Small Grants Programme, and implemented through the Intermediate Technology Development Group (ITDG), the Ministry of Energy and the community. ITDG monitored the project and provided technical support, whilst the community contributed labour estimated at 30% of total costs. ITDG continues to monitor the project and provide technical support. The project demonstrated how the decentralisation of energy supply can generate community participation in energy planning and thereby ensure access to energy for poor communities. Government support was gained thanks to the inclusion of the Ministry of Energy as a project partner from its inception. With the benefit of direct experience in implementing a micro-hydropower scheme, the Ministry was inspired to review decentralised power policy in Kenya, leading to the improvement of energy policy relating to decentralised power production. As a result of this project, the Ministry of Energy has set official standards for the micro-hydropower sector. Capacity has been strengthened to undertake micro-hydro feasibility studies, capacity to manufacture and repair system components has been built and other development partners have now supported two similar schemes in Kirinyaga District. Critically, new Government legislation and policies have been introduced. At the business centre where the community has established premises to let to business enterprises or public services, power is supplied during the day from 8.00 am to 4.00 pm. At present, power is used in eight separate stalls for welding, hair salon, barber, charging of mobile phones, selling of cold beverages and a video show room. An additional six stalls are planned for which a milling machine, oil processing (sunflower) and tobacco curing are desirable businesses. The clients are charged a flat tariff of 300 Kshs monthly (approx. USD4.5). Other planned developments of the scheme include the supply of electricity to surrounding households and water pumping which has been advocated by women in the community.

The Tungu-Kabiri Micro hydropower project was implemented by ITDG with funding support of two SGP grants of USD 38,500 for phase one (1998) and USD 25,000 for phase two (2000). The two phases took four years to complete from 2000. This project is a good example in demonstrating the role small scale renewable energy solutions can play in providing cheap energy to poor communities and providing substitute to fossil fuel based electricity generation for off grid communities.

Example No 14: East African Community Regional Strategy for Scaling-up Access to Modern Energy Services

Example No 14: East African Community Regional Strategy for Scaling-up Access to Modern Energy Services

The East African Community (EAC) is the regional intergovernmental organisation of the Republics of Kenya, Uganda, Rwanda and Burundi and the United Republic of Tanzania, with its headquarters in Arusha, Tanzania. Lack of energy access strategies poses a major risk to the ability of EAC countries to meet MDGs and reduce poverty. With a population of over 100 million people, energy poverty affects all countries in the region. Traditional biomass (wood, charcoal and animal waste) currently meets most of the region's household cooking and heating needs. However, diminishing availability of biomass resources in the region has reached critical levels. This problem, coupled with rapid urbanisation, has contributed to the increasing scarcity and high price of cooking fuel in urban areas.

The East African Regional Strategy seeks to engage EAC partner states in an ambitious initiative to scale up access to modern energy services, in order to support the achievement of the MDGs and poverty reduction. The Strategy, adopted by the EAC Council of Ministers in November 2006, is a plan to meet the region's energy and development targets by scaling up new and existing business models, leveraging development finance and securing programmatic support to ensure an enabling environment for increased energy access. Its objective is to enable at least half of the population (9.6 million households – approximately 48 million people – and 23,000 extra localities) to access modern energy services by 2015. The strategy also aims to reinforce regional integration by pooling good practices and exchanging experiences for capacity building, promote harmonised political and institutional frameworks to include energy access as a key national priority for ensuring human development and achieving the MDGs and support the development of MDG-based investment programmes.

The EAC Energy Strategy will be implemented in cooperation with various partners, including the EAC countries, UNDP, GTZ, the EU, which has shown great interest in supporting EAC in realising its energy access goals through its Energy Initiative, and UN Habitat, which has initiated a programme to improve livelihoods in poor urban areas and human settlements. UN Habitat is working with a group of stakeholders to improve access to modern energy services in poor urban settlements. The World Health Organisation has developed technical expertise in the field of household energy and health, which will be useful in generating knowledge on the impact of traditional solid fuel use. SIDA has been supporting rural electrification programmes in Tanzania.

The four EAC Energy Access Targets are as follows:

1. The strategy aims at introducing modern cooking practices for 50% of those relying on traditional biomass for cooking. Various options for improvement include improved cook-stoves, biogas, liquefied petroleum gas, etc;
2. The strategy aims to increase access to electrification of the urban and peri-urban populations.
3. Access to modern energy services for all schools, clinics, hospitals and community centres.
4. Access to mechanical power within the community for productive use and heating for all communities.

The outcome of the Strategy is that an additional 9.6 million households (approximately 50 million people) will have access to modern energy services. The Strategy will contribute to a reduction of net greenhouse emissions from burning of traditional biomass and fossil fuels through the use of energy-efficient stoves, biogas and expansion of rural and urban electrification. The sale of these technologies will also contribute to employment growth in the energy sector.

Example No 15: The Kuyasa Low-cost Urban Housing Energy Upgrade Project:

The Kuyasa Low-cost Urban Housing Energy Upgrade Project ('the Kuyasa Project') in Khayelitsha, a suburb of Cape Town in South Africa, demonstrates how sustainable energy interventions can be effective in meeting the energy service needs of low-income communities. The project also illustrates how international mechanisms, such as the Kyoto Protocol's Clean Development Mechanism (CDM), can be linked to poverty alleviation and sustainable development. The Kuyasa Project is the first African CDM project to be registered with the United Nations.

The Kuyasa Project is a retrofit activity which entails the installation of solar water heaters (SWHs), ceilings and ceiling insulation, and compact fluorescent lights (CFLs) in 2300 existing low-income (Reconstruction and Development Programme, or RDP) houses in Kuyasa, thereby significantly reducing CO2 emissions over a 21-year period through the avoidance of electricity or alternative fossil fuel use by the households. Project revenues are limited to community contributions combined with income from the sale of emission reduction credits through the CDM. 'Carbon income' is estimated at 15-20% of the project's financing needs. Therefore, a significant amount of grant finance was required in order to close the gap between revenues and costs. This finance was secured through grant funding from both the national and provincial levels of government, including the Department of Environment and Tourism's Poverty Alleviation Fund and a Provincial Housing Department Research Grant. Further smaller amounts have been awarded by Électricité de France, the French utility company, and the International Council for Local Environmental Initiatives.

These sources of funding generally provide one-off grants and are thus not considered to be sustainable, as they cannot be relied upon for similar projects in the future. Combined with this, carbon revenues at current prices are insufficient to fulfil the project's financing needs. As a result, there is need for a financial model to enable project replication in other areas of South Africa. Access to sustainable financing is key to the replicability of the project.

The Sustainable Financing Model Project is expected to enable significant learning regarding the use of the CDM and TRECs in the financing of similar projects internationally, as well as for the financing of renewable energy and energy efficiency projects in low-income urban communities in South Africa. The model needs to be relevant to the South African context, and to involve its financial institutions and project beneficiaries as stakeholders. The Kuyasa Project and the development of a replicable funding model will help improve to the investment potential and policy outlook with regard to increased use of renewable energy in low-income housing areas.

Feed-in tariffs have a number of advantages over several other commonly used renewable energy incentives (Courture et al. 2009). They are simple for administrators to implement and producers to utilise. The contract is simple and the payment plan is fixed (one price for every kilowatt hour produced). Producers are not confronted with the complications common in many other financing schemes and policies, such as negotiating with utilities companies. FITs provide stable funding for renewable energy projects over a 20 year period and remove barriers to participation, allowing individuals with little tax liability or non-taxable entities - cities, counties, states and non-profits - to pursue renewable energy projects. They also support the prioritisation of renewable energy by first requiring utilities to purchase renewable electricity and feed it into the grid.
Feed-in tariffs have a number of advantages over several other commonly-used renewable energy incentives (Courture et al. 2009):

- FITs are simple for administrators to implement and producers to utilise - the contract is simple and the payment plan is fixed (one price for every kilowatt hour produced), meaning that producers are not faced with the complications common to many other financing schemes and policies.

- They provide stable funding for renewable energy projects over a 20 year period.

- They remove barriers to participation, allowing individuals with little tax liability or non-taxable entities - cities, counties, states and non-profits - to pursue renewable energy projects.

- They prioritize sources of renewable energy by first requiring utilities to purchase renewable electricity and feed it into the grid.

The following practices for successful feed-in tariff programmes have been recommended.

- Planning and administration: FITs can be administratively time-consuming to set up initially. A streamlined approvals process should be established to reduce administrative barriers, minimise transaction costs, and allow a wider variety of producers to participate.

- Contract terms: Successful FITs draw up contracts that guarantee a long-term, fixed price payment for 100% of electricity produced, as well as interconnection to the grid. Contracts should preferably be for 15-20 years duration, in order to provide stability and investment security. Longer contract terms should also involve lower costs, to level out project costs.

  Setting rates: Payment levels are most successful if they are based on the levelised cost of renewable energy generation and generate a reasonable profit for developers and investors. Certainty of project cost recovery reduces the complexity and risks of project financing and allows investors to obtain increased levels of debt financing, thereby lowering overall financing costs. Programme administrators should make detailed analyses of technology costs and resource quality to determine payment levels. FITs can overheat the market if tariffs are set too high, or conversely, have little market impact if set too low. In general, successful FITs do not have project size or overall programme caps.

- Rate differentiation: Rates should be differentiated for each technology based on their resource potential, cost to generate, geographical distribution, and technological maturity. Administrators should also consider offering separate payment levels by project size and resource quality, to prevent less than optimal project siting or, conversely, to ensure that renewable sources are widely dispersed and tapped.

- Adjusting rates: Rates should be increased as needed for inflation, but generally should decrease for new projects each year. This process should be predetermined and transparent.

- Sharing costs: Added costs of the FIT should be incorporated into the electricity rate base, to allow costs be distributed equally through electricity rates and to assure producers that they will receive payments, regardless of market disruptions.

Role of NGOs

Cooperation with non-governmental organisations (NGOs) and local or regional associations can limit overall programme costs. Whilst most NGOs and associations will not have the monetary resources to provide direct funding to PV projects, they may still provide important infrastructural support by organising end-users to secure favourable financing terms, providing training to end-users or installers, facilitating the transport of project equipment and supplies, or tapping into foundation or ODA money with specific local requirements. NGOs include international organisations operating with specific renewable energy goals, such as REEEP, as well as other international organisations with broader environmental or social purposes, such as the WWF (Worldwide Fund for Nature). Co-operatives are commonly local groups of end-users who pool resources to improve access to PV systems or other community improvements by organising favourable local financing terms or developing credit unions. PV programme developers should consider working with community leaders to enhance or develop co-operatives in project regions.

All forms of electricity generation require financial resources, management, operational and management structures and an overall framework that ensures that only power systems of high quality are installed and available on the market - the case is no different for rural electrification and other types of electrification. Renewable energy and PV programme planners in developing countries have a range of financing options to choose from. Both multilateral and bilateral development funds can be important resources, but perhaps even more important are the resources within developing countries themselves.

Many developing countries have national funds that can support renewable energy programmes. Foundations and commercial loans can further meet funding needs. Finally, there are funding mechanisms or means of structuring funding that can reduce overall project costs, including working with local non-profits and co-operatives, local micro-enterprises, or even local utility companies. In developing the most appropriate financing mix, programme planners should consider both the government infrastructure in the country or region where the programme will take place and the constraints of the project itself. The role of end-users must also be considered and facilitated. Planners must be cognizant of the types and levels of risk incurred by their planned programme, and should both plan their programme and structure their financing package to mitigate these risks. The project time-frame, the level of financing required and the engagement of national and local actors are all factors that will affect the desired financing mix.

The establishment of a long-term sustainable rural electrification market in developing countries depends on a number of key factors, including:

- The commitment to rural electrification and poverty alleviation demonstrated by public authorities.
- Whether there is a level playing field, where all technical options can fairly compete with each other so as to allow for real best-cost solutions to be integrated in a programme.
- The establishment of an institutional and financial framework that addresses the fundamental programme functions, the agents required to perform these functions and the types of relationships that must exist between each agent and the other stakeholders.
- The level of participation (including financial) sought from the beneficiary community.
- Access to affordable services where end-users can make informed choices.
- The availability of viable business opportunities for service providers where risks are minimized as much as possible.
- A system that is sufficiently regulated to ensure that tariffs are affordable and justified and that quality is maintained at all stages of the delivery chain.

Finally, the financing process can be lengthy and should therefore be considered early in the programme planning phase. The costs of financing, including interest rates, fees and time requirements, must be factored into the programme. Conversations with potential financiers should be held early, even before the risk analysis and business plans have been drawn up, to guide programme planners in the requirements and interests of individual financiers. With careful attention to financing options and programme variables, many combinations of financing sources will be available to support decentralised electrification and renewable energy projects in the developing world. However, planners will need to spend sufficient time at the onset of a rural electrification or development programme to identify the full "mechanics" of the framework - that is, its functions, agents, responsibilities, relationships, contracts and financial packages, as described above.

4

LEADING BY EXAMPLE IN HIGH PERFORMING CITIES

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In response to the increasing stresses of global climate change and energy supply and security issues, states and local governments are using their regulatory authority to mitigate greenhouse gases (GHGs) through Leading by Example (LBE) initiatives. Local governments lead by example by adopting formal policy commitments for energy efficiency and renewable energy in publicly-funded buildings and facilities, and by providing assistance to local businesses and residents to do the same. LBE demonstrates a government's commitment to fiscal responsibility and environmental stewardship, and increases demand for efficient and clean energy products and services.

LBE is used by local governments to demonstrate the feasibility and benefits of energy efficiency and renewable energy standards to the building community, industry leaders, policymakers and others who may be otherwise hesitant to support new energy regulations. The benefits of local government LBE include:

- Incorporating more advanced energy efficiency practices into new or renovated buildings familiarises and increases the knowledge of the construction industry and code enforcement officials, and increases demand for such products from product suppliers, manufacturers and service providers;

- The reduced energy bills resulting from LBE efforts demonstrate responsible stewardship of Government finance;

- Setting energy targets provides leadership and a common goal for local government to work towards;

- Well-publicised government programmes raise awareness of energy efficiency and renewable energy opportunities and help to change behaviours at individual and societal levels;

- Increased reliance on energy efficiency and renewable energy, rather than traditional fossil fuels, helps governments to hedge against uncertain future energy costs and availability, and reduces governments' susceptibility to fuel price volatility;

- LBE actions create jobs and stimulate the local economy.

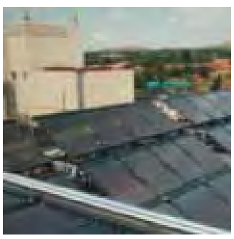
Successfully implementing local-level energy efficiency and renewable energy policies adds credibility to a country's national energy efficiency efforts. For example, states that have had difficulty passing energy codes often adopt energy standards for public buildings as a manageable first step, giving stakeholders a "trial run" to become more comfortable in understanding and implementing the standards. Further, states that have had success in adopting energy codes and other building measures often adopt higher standards for public buildings. In both cases, public building standards ratchet up building energy performance, paving the way for more advanced nationwide policies.

LBE actions by local governments include:

- Advanced energy efficiency or renewable energy requirements for new or existing publicly funded buildings, such as libraries, government buildings and hospitals; facilities, such as garbage, water supply and wastewater treatment plants, street and public area lighting; and fleets (government-owned vehicles).

- Requirements for energy-efficient product procurement, such as requiring all appliance and equipment purchases to meet the ENERGY STAR 1 or comparable standards.

- Using renewable energy, often through one of the following means:
  - Purchasing renewable energy directly from the electricity provider, often as a fixed percentage of monthly use of this report;
  - Buying Renewable Energy Credits (RECs) and/or generating renewable energy at public facilities or on public lands. By generating renewable energy on-site, governments obtain improved power quality and supply reliability, incentives for renewable energy generation and the option to sell surplus electricity generated to the grid. The renewable energy technologies typically used on-site include small wind turbines; solar photovoltaic installed on a building or as stand-alone systems on parking meters, bus stop canopies, or street or parking lot lights; solar hot water; solar process heating and cooling; geothermal heat pumps; biomass for use in waste-to-energy applications and landfill gas, which involves equipping landfills and other facilities to capture biogas and convert it into electricity.



Often, governments fund public sector energy efficiency and renewable energy programmes through their own budget allocations or through federal or state grants. Other sources of LBE programme funding may include:

- Energy Service Company (ESCO) or other third-party performance contracts;
- Utility rebates to public sector customers, or in some cases utility loans to public sector customers which are repaid over time on their energy bill;
- Capital raised by state or locally-issued revenue or general-obligation bonds;
- Revolving loan funds for energy-saving projects, with initial capital coming from grants, bond issues or other sources (such as environmental fines or legal settlements);
- Dedicating money from energy bill savings from previous energy efficiency improvements to be reinvested in new energy-saving programmes or projects; or
- Revenues from a city-owned electric or gas utility.

State and local governments can use the cost savings from energy efficiency to fund additional efficiency improvements and/or on-site renewable energy generation, such as:

- Setting state-level goals for improving public building efficiency (e.g., by 50% or more) and collaborating with the energy codes community to reach those goals will help states meet energy policy objectives.
- Governments should negotiate terms for energy purchases that reflect government or community-specific preferences, such as a preference for locally-generated green power. Governments can also aggregate demand for energy-efficient products or services or for green power with other jurisdictions to negotiate lower rates and reduce transaction costs.

It is also important to carry out consumer outreach, in order to ensure that the public is aware of local and state government measures to reduce its own energy consumption. Complementary policies and programmes work together to maximise impact and attain a multitude of benefits. Cities can implement climate and energy plans to achieve load growth management, energy supply diversity and security, decreased, stable energy prices, reduced air pollutant and GHG emissions and new sources of revenue from modern, clean energy technologies. Ultimately, these benefits equate to improved public health and quality of life for local residents. Other factors driving cities to adopt and implement climate and energy plans include:

- Strong leadership from the highest levels of the city government to champion the plan and guide it to completion.
- Historical precedence for environmental awareness and support from the community.
- The existence of a favourable policy environment from higher levels of government. This can include state support, such as renewable portfolio standards and interconnection standards, as well as federal support.
- Economic stimulation, using energy efficiency and renewable energy as drivers to create jobs and support the local economy.

A number of best practices can help a city to develop a strategy for comprehensive climate protection plans:

1. Conduct an inventory of greenhouse gas emissions produced by the city within a particular year. The inventory provides a benchmark against which the city can measure its progress in reducing greenhouse gas emissions. The inventory should collect data about energy management, recycling and waste reduction, transportation and land use.
2. Set an achievable target to lower greenhouse gas emissions by a specific year.
3. Develop a climate action plan. This involves planning a suite of programmes and actions that will reduce greenhouse gas emissions by an identified target amount. The plan may include measures for energy efficiency, renewable energy, green building, transportation, waste reduction, land use and other goals.

4. Implement the climate action plan. Successful implementation is highly dependent on a realistic timeline, management and staff, financing mechanisms, community support and other variables.

5. Monitor and evaluate performance and report results. It is important to track and evaluate the plan's progress to make sure that it is achieving its goals. Reporting the plan's results builds political and community support, maximising its effectiveness. By committing to energy efficiency and renewable energy, high-performing cities are playing a key role in solving the climate crisis by becoming less resource-intensive and more self-reliant. The example below shows how the Ugandan government managed to drive through its energy savings programmes to achieve energy savings objectives.

Example No 16: Promotion of Solar Water Heaters in Uganda

In 2008, the Ugandan Ministry of Energy launched a two-year pilot project aimed at encouraging the use of solar water heaters. Over two years, they installed 500 solar water heaters in Kampala and Entebbe and over a period of six years, they plan to install 65,000 solar water heaters. The REEEP Uganda Project focused on electricity savings during peak hours by switching water heating in households and institutions from electricity to solar water heating. The project succeeded in establishing appropriate financing mechanism for manufactures, vendor companies and consumers. It also helped the government to develop policies to promote the technology in Uganda, to establish standards and guidelines for integrating SWH in buildings, and to prepare an investment plan to finance replication and scale-up of SWH use. Through this project, the government managed to save 1 MW of electricity during peak hours.

5 CAPACITY-BUILDING MEASURES FOR RENEWABLE ENERGY PROGRAMMES

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Many renewable energy projects and programmes that have been implemented in the past have failed because of the absence of adequate capacity-building a lack of skills at all levels, from Government departments and implementing agencies to installation and maintenance personnel. This lack of local capacity can be relatively easily addressed if appropriate measures are identified at an early stage in the project life-cycle.

This section provides an introduction to capacity building measures that should be addressed at an early stage in the planning and implementation of an RE programme, in order to facilitate the development of a sustainable RE market in a country. The capacity building activities should be prioritised and must be geared to the progress of a given programme. Capacity building measures are equally important in countries without independent or strategic programmes, if RE is to meet some of the energy needs of the country in a sustainable manner. This section identifies capacity building measures that may be implemented for government departments, utilities and end-users.

Capacity-building measures can support individuals or groups to identify and address issues and to gain the insights, knowledge and experience needed to perform effectively. These include the creation of an enabling environment with appropriate policy and legal frameworks, institutional and human resources development and strengthening of managerial systems. Capacity building can also facilitate the provision of technical support activities, training, specific technical assistance and resource networking. It is a long-term continuing process in which all stakeholders participate. This is often not well understood by government ministries and experts in charge of sector portfolios. Therefore, it is important that RE and EE expertise is developed in those ministries addressing the rural population, for instance.

To achieve this, capacity building is required across many sectors, organisations and groups. The capacity building required is diverse and the actual requirements will vary from country to country. The type of capacity building activities that may be required include developing skills for awareness raising, evaluation and selection of technology options, preparation of business plans, resource assessment, investment promotion, financial analysis, project finance, technical advisory services, product development, establishing community-based utilities, setting tariff structures and accounting procedures. It is also important to recognise that the right capacity must be built in the right organisation. For instance, government ministries and departments should not generally be considered as suitable entities for the implementation of projects. Implementation should instead be undertaken by entities that have the necessary technical and managerial expertise, such as an electricity utility company or suitably qualified NGOs. The role of government should be to set policy and regulations and to enforce these regulations.

It should also be recognised that many of the problems associated with rural electrification using off-grid renewable energy technologies is as a result of the 'stop-start' nature of many development aid related projects. This results in a limited amount of capacity building in specific sectors. The lack of a sustainable approach means that this expertise is often dissipated after a project is completed. The needs and priorities of all relevant sectors should be taken into account in rural electrification programmes in order to maximise the synergies between them. The private sector also has an important role to play, and should be encouraged to provide capacity building and to support the local RE market. It is in the interests of the private sector and RE businesses to ensure that installers, technicians, programme designers and end-users are all better informed, so that there are fewer failures and the local RE market is developed more quickly.

The Importance of Training Local Technicians

In a pilot PV project in Zimbabwe, it was found that technicians were not installing PV to a high quality, as a result of a lack of care and not using the appropriate tools. The wiring work was of poor quality, and technicians often damaged the roof and walls and did not set the azimuth or angle for the PV module correctly.
A training facility for local engineers and technicians was therefore established to upgrade the level of maintenance and indtallation.

JICA PV Project – Zimbabwe case study

PV training for engineers in Sudan

Assessing the need for capacity-building

The level of capacity varies considerably between different countries, provinces, and even localities. It is a prerequisite that, before any RE or EE systems intervention is implemented, an assessment of the existing capacity within the country or locality is undertaken in order to assess additional measures that need to be implemented. Furthermore, it is important that identified additional measures are integrated with the local infrastructure, as opposed to imposing a series of new and often unfamiliar measures onto existing structures. It must be recognised that the level of support required will change over the duration of a programme or the development of a sustainable market, meaning that some measures will be required that were not identified during the initial assessment phase, or that measures identified as important are not in fact required to the level proposed. It is therefore important that a flexible approach is taken to allow capacity building measures to adapt to the reality in the field – this is, they need to be integrated into a programme rather than viewed as a separate project.

Example No 17: Capacity-Building in South Africa

Between 1998 and 2002, €15 million was allocated to a European Commission programme to supply 1000 South African schools with PV systems. The Technical Assistance component, which was largely made up of capacity building activities, was spread over two years. Capacity building accounted for just 4% of the total project cost, or €670 per kW installed. A Technical Assistance Unit (TAU) was set up to advise the implementation agency (Eskom) and the supervisory Ministry (Department of Minerals and Energy) on technical and project management issues. The TAU worked within the Department of Minerals and Energy. During the first months of the TAU's existence, technical problems became apparent which resulted in the installation process being halted for some time, in order to enable these issues to be addressed. The TAU developed improved procedures for system installation and commissioning and trained Eskom's Commissioning Officers. The procedures were then implemented in co-operation with Eskom and through ongoing liaison with Eskom staff and installation contractors. Further capacity building took place through training emerging contractors. This resulted in a smoother implementation of the second phase of installations and an increase in the chances of long-term sustainability of the installations.

Re: Large Scale (1000 Schools) EU Funded PV Project in South Africa

Traineeship in South Africa

Example No 18: Capacity-Building for Local Installers in the Sahelian Countries

The Regional Solar Programme (RSP), carried out in the Sahelian countries (Burkina Faso, Cape Verde, Gambia, Guinea-Bissau, Mali, Mauritania, Niger, Senegal and Chad), placed particular emphasis on supporting the development of local know-how through built-in training programmes and adopting an integrated Quality Control Approach (QCA). This covered the training of local installers and assessment of performance five years after installation. The cost of this training and quality control was very low compared to the PV system cost, although this amount was specifically identified.

By carrying out the training as well as adopting the quality approach, the RSP improved the reliability of local PV systems. Five to ten years after installation, more than 95% of the systems were still functioning in serving the needs of local communities.

Re: Lessons from the Regional Solar Programme (RSP) in the Sahelian Countries

Government Bodies

In many countries, government ministries, departments and authorities are responsible for setting policy which affects the development of the renewable energy sector. Government ministries or departments can directly and indirectly affect the development of the RE sector and foster the creation of a sustainable market. Renewable energy sources should be viewed by the government as part of the development process from a cross-sectoral perspective rather than solely from an energy perspective. It is important that agencies addressing government programmes requiring the use of RE sources, for instance in the health or education sectors, have access to renewable energy technologies expertise. Renewable energy expertise does not have to exist within each ministry, although there should be an awareness of how renewable energy can contribute to the sector goals of the ministry. It is important that capacity is developed within the appropriate levels of government and that each ministry has easy access to available renewable energy experts.

Utility Sector

Public utility companies or service companies administer the electricity grid within a country and are responsible for electricity distribution and sometimes generation and transmission of electricity. This situation is changing, with deregulation and privatisation of the electricity sector occurring in many countries. However, electricity and the supply of energy are still generally viewed by consumers as a "community service", and the rural electrification policies of the government are often implemented by the established utilities companies.
The utilities companies responsible for rural electrification should consider adopting a strategy that would bring power to the most people at the least cost. The least-cost solution could be through grid extension or mini-grids, but this approach must also address how power is to be brought to those who are not going to be connected to the grid in the foreseeable future. It is therefore important to have a detailed knowledge of the status of electrification in the country, as well as of rural electrification needs.

Photovoltaic provides electricity for lighting in this health clinic in Africa

This enables organisations interested in providing electricity to rural areas to do so in the knowledge that there are no plans to extend the grid to that area in the near future. In order for the deployment of renewable energy technologies to be sustainable in the long term, it is critical that off-grid rural electrification programmes are integrated and coordinated with existing plans for grid extension, including isolated grid systems. This should prevent potential conflicts from developing between electrification strategies, and should also help in managing the expectation of end-users.

It is also important that new sources of energy are accepted as a potential source for meeting rural energy needs. However, in order for this to happen, the technology must be understood and accepted by the utilities companies as well as potential beneficiaries. Utilities companies' engineers and managers are often asked to advise on or recommend new projects. However, if the utilities companies do not understand that RE is a viable technology that can meet rural energy needs, then they can potentially undermine initiatives for the introduction of RE-based systems into rural areas.

Capacity building activities that can be implemented for the utility sector include:

- -raising through seminars on the various applications of renewable energy systems and how renewable energy can be used as an alternative to grid extension. This may lead to an unbiased outlook within the utility company when designing and implementing rural electrification projects.
- Technical training courses for engineers and technicians to enable them to undertake systems design and maintenance and to thereby appreciate the potential and limitations of renewable energies technology.
- Encouraging staff to undertake true life-cycle costing of all alternatives when planning the supply of electricity to rural communities.
- Ensuring that staff understand rural communities' energy expenditure, so that comparisons are made with those costs, rather than with the cost of grid electricity in another location.
- Training in socio-economic and environmental impact assessments.
- Encouraging investigation by the utility into supplying renewable energy systems to remote communities, either as a commercial business section of the utility, via a 'fee for service' structure, or via a whole new business structure. If this approach was adopted, then the staff involved would require business, and possibly sales and marketing, training.
- Awareness-raising of where energy provision fits within overall government strategy on rural development and sectoral priorities in health, education, water and agriculture.
- This training might be carried out by local or international consultants on the technical issues of off-grid rural electrification and by the government on cross-sectoral polices of development and poverty alleviation.

End-user Training – A Factor in Service Satisfaction

In 2008, a survey was carried out to assess end-users' satisfaction with their Solar Home Systems (SHS) in Namibia. Most stated that they were satisfied with the technical performance of the system and the after-sales service provided by local technicians. However, many were not satisfied with the power delivery of the system.
They had not been informed about the limitations of SHS electricity compared with grid electricity.
Ènd-user training could increase service satisfaction and contribute to better image for PV technology.

Need, Policy, Market Development – PC Dissemination in Namibia

Beneficiaries

For a renewable energy implementation programme to be sustainable, it is important that the technology is seen to be of benefit to the beneficiaries – it must meet their needs. It is important that people are made aware of the benefits that can accrue from the provision of electricity services. These benefits relate not only to the provision of domestic lighting, but also to vaccine refrigeration and lighting provision in health clinics, provision of modern information and communications technology and access to improved education provision, as well as possibilities for income generating purposes. It is also important to appreciate that the majority of rural users would prefer to be connected to the grid and have power readily available, like the urban population. All awareness-raising activities must take this factor into account. The importance of appropriate capacity-building measures cannot be over-emphasised. Many renewable energy-based programmes have not met with the success anticipated because these issues have not been addressed adequately, if at all. Unfortunately, the project-by-project approach of many agencies means that local skills and capacity are not developed in a strategic manner, meaning that once a project has been completed, the skills gained tend to dissipate, and the process has to start again when the next project is initiated.

To overcome this problem, it is important that a more coordinated and programmatic approach is taken - this is the only way to build a sustainable market which has significant, but not exclusive, private sector engagement. Although there is inevitably a cost associated with the implementation of effective capacity-building measures, their significant impact on the sustainability of an intervention justifies this additional cost. It is important that policy makers and programme developers identify capacity building requirements during the initiation, planning and implementation stages of a renewable energy programme. It is equally important to prioritise capacity building activities and to ensure that capacity building is developed in a timely manner, in line with the development of a sustainable renewable energy market. The effectiveness of a number of best practices has been highlighted through the various examples given in this document.

Example No 19: Long-Term Capacity for Health Centres

A grant-funded government programme to electrify approximately 250 rural health facilities in Mozambique has been underway since 2005. Capacity building measures have been an important part of the project, focusing on health centre staff as the main users and maintainers of the PV systems on a daily basis. However, the quality of the instructions given to the health centre staff was difficult to assess.

There is evidence to suggest that constant re-training of the staff with regards to operation and maintenance of the systems will be important over the duration of the project, in order to ensure the best possible use of the PV systems. In the case of Mozambique, it is the Ministry of Health, through its organisation at the provincial and district level, which must assume the responsibility for training and re-training of clinic staff.

Solar Energy for Health Improvement in Mozambique

6 CONCLUSIONS

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Climate change is a global problem, but a large proportion of the responsibility for climate mitigation action falls on local and regional organisations. State, provincial and local governments wield tremendous influence in the global effort to address climate change by transforming the way energy is traditionally produced and consumed. By adopting innovative and well-crafted energy efficiency and renewable energy practices, these governments are working with a wide range of stakeholders to support the industries that will reduce greenhouse gas emissions via reduced demand for fossil fuel-derived energy, whilst reducing energy costs and boosting local and regional economies. Communities and states that take local-level action drive results on their own terms and on their own timelines. Strategic energy and climate plans overcome key barriers to the broader implementation of energy efficiency and renewable energy by providing financial, technical, and regulatory support for implementation. In addition, local level actions lead by example to create a critical momentum that leads to self-sustaining energy efficiency projects by increasing demand for and acceptance of new technologies and practices.

This manual is not intended to be an exhaustive list of the best practices in ACP countries, but simply to provide readers with examples of successful efforts to increase the use of renewable energy and energy efficiency in very challenging environments, so that these ideas and lessons learned might be considered for replication at the national, regional and local level in ACP countries. With more information on examples of successful programmes and the steps taken to achieve them, cities and states can design programmes that have a high chance of success given local circumstances, and that take advantage of the lessons learned by other cities and states.

It is the hope of the author that this document be followed by similar best practices guides highlighting other successful policies and programmes to promote energy efficiency and renewable energy at the local level throughout the world, in order to share the innovative best practices being carried out in every country, state and city.

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