

Renewable Energy Project Toolkit for World Bank Task Managers

Case Study

Uganda Energy for Rural Transformation Program

1. Overview

The purpose of the ten-year three-phase program is to develop Uganda’s rural energy and information/communication technologies (ICT) sectors, so that they make a significant contribution to bringing about rural transformation, i.e., these sectors facilitate a significant improvement in the productivity of rural enterprises as well as the quality of life of rural households. Under the program, the conventional model of government-led rural electrification is being replaced by private-sector led, commercially-oriented rural electrification with commercial debt and ‘smart’ subsidies. Further, the rural energy and ICT sectors are building selective links with end-user sectors such as health, education, agriculture, water and SMEs, while avoiding unnecessary inter-sectoral linkages that may spread implementation difficulties in one sector to other sectors.

The ERT project implements a paradigm shift in the nature and scope of rural electrification projects (Table 1)

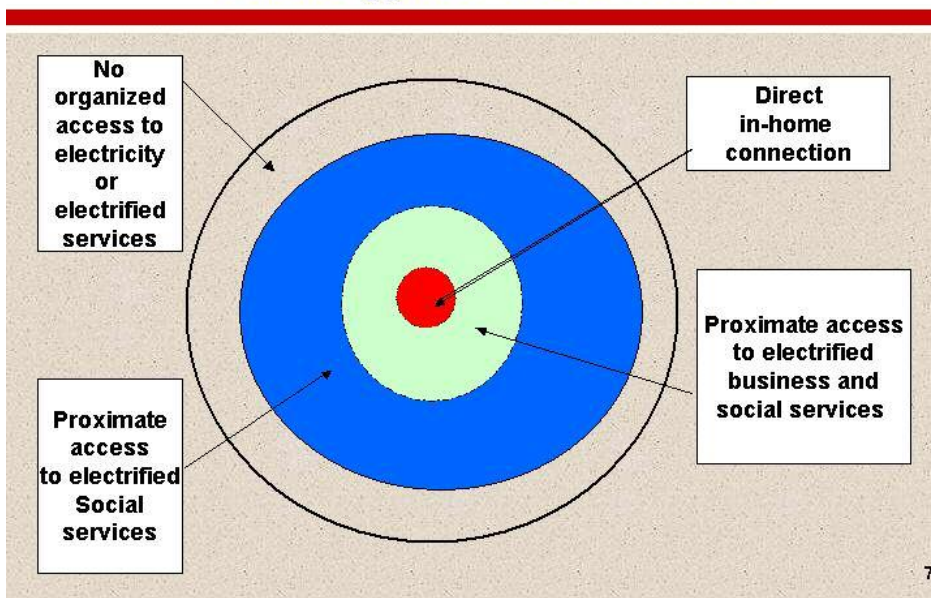
Rural Electrification Paradigm Shift	
From	To
Rural electrification <i>per se</i>	Rural transformation, which means improvements in the quality of life and increase in rural incomes, with development taking place in a sustainable manner.
Single sector (“silos” and “bunkers” mentality) approach	Multi-sector approach with cross-sectoral links, while remaining firmly anchored in sectoral skills and expertise
State-led service provision	Demand-driven, commercially-oriented, private sector led service provision, with focus on cost recovery, and recognizing that this will imply higher tariffs for some regions.
Unworkable, implicit subsidies	“Smart” subsidies that improve affordability while maintaining efficiency of operations and promoting output
“Directed credit” schemes that do not strengthen the financial sector as they do not address the fundamental problems	“Credit support facility” that addresses underlying problems such as risk perceptions, liquidity mismatch, and thus make it more attractive to financial institutions to lend for rural electrification and ICTs
Outdated, high-cost technical standards and technologies	Appropriate, low-cost standards and emerging technologies, including using renewable energy suitably.

The paradigm shift is based on the lessons learned in the 1970-1990s. Overall, the "first generation" of rural electrification programs in the 1970s and 1980s did not lead to the expected development impact. Further, these programs usually proved to be very expensive, which had a crippling effect on the State-owned utilities that undertook them. Thus, the subsidies provided for rural electrification not only did not provide any significant benefits to the intended beneficiaries but also often impeded the normal functioning of the power utilities, thereby also effectively blocking expansion of access to the excluded population.

An OED review - *Rural Electrification: A Hard Look at Costs and Benefits*, OED Precip No. 90, May 1995 - of Asian RE programs noted that most of them had higher costs and yielded fewer benefits than expected. Among the review's recommendations were:

- “project appraisal needs to focus more attention on identifying the economic limits of extensions to the grid and on the economic potential of alternative energy sources, particularly solar energy.” The ERT project design fully incorporates this approach to cost reduction, in addition to the introduction of lower-cost technologies and processes.
- “RE reduces rural poverty only through a general rise in income obtained by productive uses.” Consistent with this, and based on the experience of the Rural Business Services program of the Indonesia Second Rural Electrification Project, the ERT project is focused on serving SMEs along with households. The strategy for households is shown below.

Strategy for households



- “a rational system of cost recovery is a key policy ingredient of any RE project.” The ERT project calls for a system of transparent and explicit subsidies along with an emphasis on cost recovery *via* commercially-oriented rural electrification.

More recent reviews and reports of selected country experiences with rural electrification – Thailand, Costa Rica, Indonesia, Chile, Mexico, Cote d’ Ivoire, South Africa, the Philippines, and Bangladesh – provides a broader diverse base for understanding what makes RE programs successful. While the various countries used a variety of institutional models and approaches, and there are no fixed blueprints to follow, there are some common guiding principles:

- Decentralization of decision-making, with demand-driven selection criteria for service expansion rather than top-down “RE Master Plans”
- RE should be set up on a commercially viable basis, with some subsidies generally required, but recurrent cost subsidies undermine sustainability.
- Development impact can be increased by subsidizing access, (i.e., low connection charges instead of consumption), cost-recovery based tariffs, and working with rural enterprises to enhance their productivity.
- Reduce costs by promoting low-cost equipment and technical specifications. □

Phasing. The three phases are roughly equal in terms of time. The first phase, which started in 2002 and reached mid-term in 2004, is small in terms of investment, as the focus is on building the necessary capacity as well as the institutional and policy framework; the pace of investments would pick up in the second and third phases. In the first two years of Phase 1, good progress has been made in putting in place a functioning conducive environment and related capacity for commercially oriented, sustainable service delivery of rural/renewable energy and ICTs.

2. Renewable energy

Uganda is well-endowed with renewable energy resources, whose development would contribute to environmental protection as well as rural transformation. For this purpose, the program includes support from the Global Environment Facility (GEF), which will support renewable energy development through a programmatic approach parallel to the Bank's Adaptable Program Loan (APL) instrument. Further, the program also features sales of carbon emissions reductions, via the Prototype Carbon Fund (PCF).

In Phase 1, GEF funds are being used to: (i) develop a strategy and implementation plan for building the capacity of in-country intermediaries to identify, develop, appraise and move towards financial closure renewable energy investments, (ii) prepare a renewable energy resource information collection and dissemination system that provides reliable data that enables interested private sector investors to initiate their own assessment of potential projects; and (iii) activities to help reduce the gap in solar photovoltaic product prices, quality and range by moving Uganda in the direction of international best

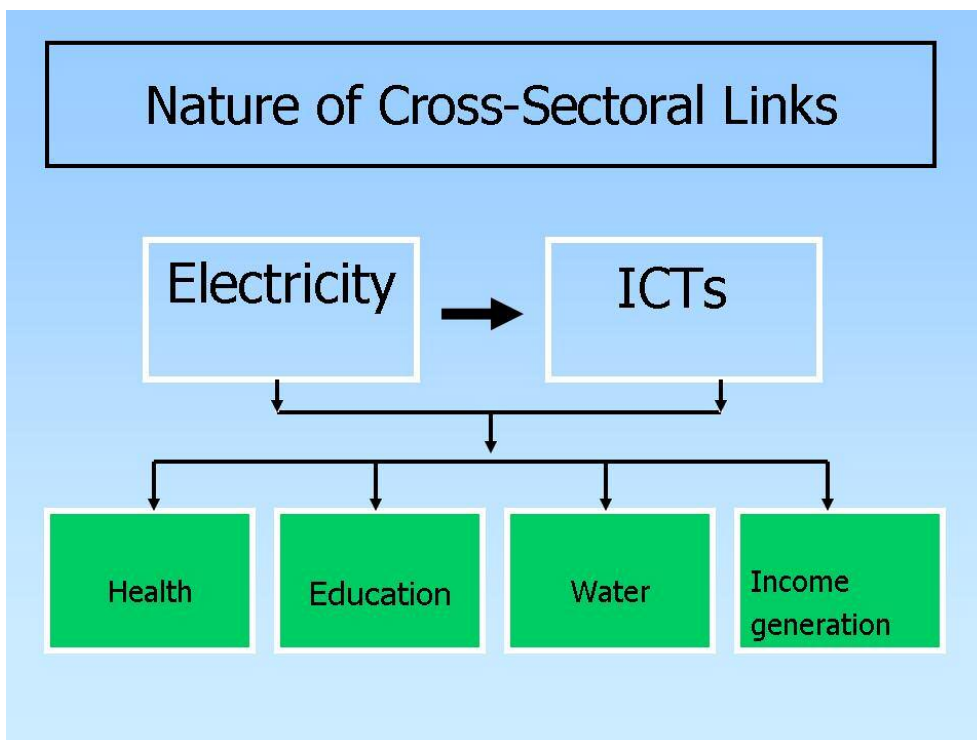
practices, as applicable to Uganda.

The renewable energy components are:

- **Main grid related power generation.** This could be for sale to the grid operator, or to end-users, *via* wheeling. An example is the Kakira sugar mill co-generation project, supported by GEF, which will sell power to the grid operator. Project construction has commenced.
- **Independent grid systems** for relatively concentrated isolated areas with a potential for the use of electricity by rural enterprises. An example is the West Nile project, supported in part by the PCF, which features a vertically integrated utility with mini-hydro power generation. While a private sector operator has taken over the ownership and operation of the independent system, construction of the mini-hydro is awaiting financial closure.
- **Solar PV systems** for rural health, education and water facilities as well as households. Progress in the water sector is ahead of schedule, but there have been implementation delays in the health and education sectors.

3. Cross-sectoral links

The ERT project features cross-sectoral links of electricity and ICTs with the health, education, water and agriculture sector. Most of these links will be powered by solar pv equipment.



The cross-sectoral links are important because they will provide indirect benefits for the huge numbers of households who will not be directly connected in the next two decades. These ‘unconnected households’ will be served by the cross-sectoral links, which will help health, education, water provide better service to rural customers and the facilitate income generation by non-farm rural enterprises.

In the past, multi-sectoral projects were not a success. However, the ERT project’s design takes account of the lessons learned. According to *Decentralization: A New Strategy for Rural Development*, Agriculture & Natural Resource Department, World Bank, 1995, the main reasons for the failure of the Integrated Development Projects in the 1970s and 1980s were:

- Adverse policy environment - particularly for Agriculture
- Lack of government commitment
- Lack of appropriate technology
- Neglect of institutional development
- Lack of beneficiary participation: top-down
- Complexity of design - centralized design

To take account of these problems, the ERT project design has the following features:

- Demand-driven investments by working closely with the line ministries of health, education, water and agriculture, instead of just the energy ministry
- Takes care to build local capacity, particularly local authorities
- Is technology-neutral, using proven technologies only
- Includes only synergistic, one-way links only, and avoids links that introduce “domino” effects that transmit problems from one sector to others or links that would imply extensive inter-sectoral co-ordination
- Minimizes inter-sectoral “turf” issues by letting each participant play “natural” and customary role

4. Policy and regulatory issues

The government has adopted, in consultation with the Bank, a commercially-oriented approach towards rural electrification, with the government playing the role of a market enabler. The main elements of the policy platform to support implementation of this strategy are:

(i) Level playing field for private sector participants. This implies a market/sector structure that will:

- Permit private sector entry for supply of electricity - generation, transmission, distribution/retailing - from the interconnected grid system as well as stand-alone, independent mini-grid systems.
- Ensure fair competition for all suppliers with respect to UEB and its successors, in particular, all necessary steps will be taken to ensure that UEB does not have an unfair advantage over potential private sector participants in competing for

distribution/retailing of electricity purchased in bulk from the UEB-operated grid system.

(ii) Enabling regulatory framework. The project will help create a regulatory framework that has:

- Clear separation of responsibilities of: (i) planning, monitoring, policy setting, licensing and permits, establishing/promulgating regulations, (ii) compliance (“regulator”), and (iii) conflict/resolution, arbitration, and adjudication in cases where an involved party wishes to appeal a finding of the regulator. □
- "Light-handed regulation" procedures and processes for small, stand-alone grid-based power system systems.

(iii) Cost recovery and cost-based tariffs, to facilitate private entry and local initiatives:

- The Government has agreed that consumers in different parts of the country will pay different retail tariffs *with the exception that there would be a uniform tariff on the existing grid*, and that the tariffs for some consumers will be significantly higher than for others, even after subsidies have been provided for.
- Bulk-supply tariffs based upon the cost of supply at the delivery point in the main grid system. □
- Non-discriminatory wheeling tariff (and access) to facilitate power transactions between distribution concessionaires and third-party generators.

(iv) Subsidy transfer, i.e., a Rural Electrification Fund (REF) to take account of regional and other considerations, with due consideration to efficiency and sustainability under a regime of cost-based regionally-differentiated tariffs and multiple service providers in the future. In particular, the project will help the Government design schemes and allocation procedures so that:

- Subsidies are well-targeted for the intended beneficiaries, taking account of the varying ability to pay. This would include geographic targeting, such as distinguishing between peri-urban, rural, and "premium rural" areas, where the last would enjoy the highest subsidy levels.
- Subsidies evoke an efficient supply response, which reduces the need for subsidies. □
- Subsidies promote performance and output, instead of being linked to inputs. □
- Subsidies facilitate financing of private sector led projects. From a commercial lender's viewpoint, subsidies made available during project construction function as equity, thus reducing the need for debt financing, and increasing the lender's comfort with providing debt financing.
- Subsidy schemes are based on good governance principles.

The ERT project supports the creation of a Rural Electrification Board and Agency, whose main function is to channel subsidies; the Board and the Agency will not provide loans or implement projects themselves. These new institutions have been created so that:

(i) the allocation of subsidies is transparent and criteria-based, i.e., not politicized, which is a danger when subsidies are channeled through the Energy Ministry or through the power utility, and (ii) there is a long-term need for a workable subsidy channel because the provision of subsidies is expected to continue for a number of decades, given that the majority of the households will not be connected even within the next two decades.

The subsidy funds to be allocated by the RE Fund will come from (i) a tax on transmission, (ii) IDA credit, and (iii) grants provided by bilateral donors.

In most cases, it is expected that the subsidy levels will be determined by a competitive system. There are two choices in this regard: (i) fix the level of tariff for a particular project, and ask prospective operators to bid on the subsidy required, or (ii) fix the subsidy level, and ask for bids on the tariff levels. The choice between the two will be made on pragmatic grounds. In the first case of a bidding process, the second option was chosen, but ultimately the subsidy level was also adjusted upwards. It is likely that there will be some 'learning-by-doing' before the choice is finally made.

The exception is the in the case of locally-initiated projects, which are small projects that have been proposed by local communities. In this case, the subsidy level will be set as a proportion of the estimated capital cost without a bidding process.

The subsidy awarding process does not differentiate between conventional and renewable generation. However, renewable energy power generation may be separately eligible for GEF or CDM funds.

The key policy and regulatory issues for grid-related renewable energy power generation are the (i) purchase price and arrangements, and (ii) wheeling tariff and arrangements. The absence of a standardized power purchase agreement and tariff delayed the Kakira project.

For independent mini-grids, the key issues are the (i) levels of subsidy and tariffs, and (ii) risk-sharing interventions needed to facilitate provision of commercial debt to finance the projects. In general, it is difficult for governments and regulators to approve cost reflective systems for independent grids than for the main grid, which increases the subsidy required, but the regulator has approved a higher tariff for the West Nile project. An innovative Credit Support Facility (see below) is being developed to facilitate commercial debt finance, and this is viewed as potentially a very promising breakthrough that could help finance all rural infrastructure projects.

For the cross-sectoral links to the social facilities, the key policy issues are the (i) level and nature of service to be provided to rural facilities. In the health sector, implementation of systems has been delayed by protracted discussions about the technical specifications of the system; and (ii) responsibility for maintenance and maintenance costs. These are included in the procurement contract.

5. Business models

The basic business model is commercially-oriented, private sector led rural electrification and renewable energy development. Effectively, this means that any entity other than the government can be a service provider or project developer. In the case of the cross-sectoral links, the government, *via* the Ministries of Health, Education and Water, is the buyer of the energy services provided by private firms. Other than this, the Government's role is to develop the required policy and institutional framework, provide subsidies, and facilitate commercial debt finance.

6. Financing mechanisms

The responsibility for financing the project rests with project developer. The Government provides one-off capital cost subsidies, whether from GEF grant funds or from its own resources (including those borrowed under the project) via the Rural Electrification Fund. (see above).

For solar pv systems, the GEF grants are provided on a per-Watt basis, with a sliding scale and higher rates for social institutions. The GEF grant for sales to consumers will be paid according to the following schedule:

- \$2.50/Wp for systems up to 30Wp; □
- For larger systems, an additional \$1.50/Wp on the marginal Wp up to a maximum of 50Wp. □

For example,

- ③ a 20 Wp system would be eligible for a \$50 grant ($20\text{Wp} \times \2.50) □
- ③ a 40 Wp system would be eligible for a \$90 grant ($30\text{Wp} \times \2.50 plus $10 \times \$1.50$) □
- ③ a 60Wp system would be eligible for \$105 ($30\text{Wp} \times \2.50 plus $20\text{Wp} \times 1.50$ plus $10\text{Wp} \times \$0$) □

In addition, in Phase I, the project would support installation of about 800 institutional systems (estimated capacity 400,000 Wp) in health centers schools, and other public applications. In general, such systems will have a lower usage factor, with an estimated incremental cost of about \$ 2.50 per Wp.

At present, Uganda's financial sector is highly liquid, i.e., the banks have adequate funds available for providing credit to prospective entrepreneurs. However, the financial sector is reluctant to finance rural and renewable energy because of the real and perceived risks associated with such projects, and because there is no market for long-term loans, which are required for rural and renewable energy. To help address this problem, the ERT project will help develop a Credit Support Facility (CSF) to facilitate commercial debt finance; this facility is expected to be functional in Phase 2. The guiding principle of the

CSF would be to support, rather than supplant, normal commercial credit procedures; this is envisaged to include, at a minimum, a sectoral liquidity guarantee facility to support long-term debt financing. Further, The CSF will provide credit enhancements so that some of the risks associated with rural electrification and renewable energy are shared by the Government and the financial sector.

The funds for the CSF are expected to come from IDA and bilateral donors.

6. Institutional arrangement for implementation

The Private Sector Foundation of Uganda provides pre-investment business development assistance to potential project developers, including renewable energy developers. The subsidies are channeled through the Rural Electrification Agency. Commercial credit is facilitated by the Credit Support facility. Tariff regulation is the responsibility of the Electricity Regulatory Authority.

7. Technical issues

No significant technical issues were foreseen at the time of project design. However, a major technical issue that has emerged is the specification of the solar pv systems to be installed on rural health facilities. In essence, the issue is whether to install DC-only systems, or to include an inverter so that the facilities can have conventional AC power. Inverters were not envisaged in the project design.

8. Impacts and results

It is too early to measure the impact of renewable energy development.

9. M&E

The project includes a comprehensive, three-part M&E system:

- Conventional monitoring of outputs, e.g., systems installed and functioning
- Monitoring of impact on social facilities, i.e., how does health care provision improve after energy systems are installed
- Monitoring the impact of rural electrification on poverty alleviation, i.e., who benefits and how much

10. Key lessons learned (limit to 3-5 key lessons)

- It is important to prepare in as much detail as possible the first few investments to be financed. For example, the technical specifications of the solar pv systems to be installed in social facilities were not ready at the time of project effectiveness, and this has delayed implementation

- It is possible to include a large number of components in the project without making implementation difficult. While there have been delays in implementation, these are generally due to conventional problems such as procurement issues, and not due to the large number of agencies in the project. Further, the rapid progress in the ICT and water components is a clear indication that a flexible project design allows individual sectors to proceed at their own pace.
- Setting up new institutions such as the Rural Electrification Agency is a time-consuming process. Further, it is important to ensure that the timing of the development of the REA is synchronized with the flow of transactions that it has to process.