

RURAL ELECTRIFICATION POLICY AND INSTITUTIONS IN A REFORMING POWER SECTOR¹

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Abstract

Some of the problems that have besieged rural electrification in most developing countries include; inadequate policies, limited application of appropriate technologies, limited financing and weak institutional frameworks. In the last two decades, governments have been making various efforts at the policy level to facilitate increased levels of access and affordability of electricity in rural areas. However, the introduction of market-based reforms in the power sector in the last decade has affected existing institutional and financing arrangements for rural electrification. With the privatisation and commercialisation of power supply activities, rural electrification is being classified as a social activity that must be directly supported by government resources. Consequently, implementation of reforms has affected the rate of electrification and affordability of electricity in rural areas. There is need therefore formulate new strategies to support rural electrification. The impact of the reforms have been far reaching such that the new strategies should be rooted in government policy and could call for a re-orientation or establishment of new institutions to specifically deal with rural electrification.

Keywords: rural electrification; power sector reform; policy and institutional frameworks.

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1 INTRODUCTION

About 2 billion people in the world lack access to commercial forms of energy including electricity and cook using traditional fuels. Lack of access to electricity affects mostly rural areas of developing countries (UNDP, 2000 & GNEED, 2004). Electricity can meet a diversity of human energy needs compared to other forms of energy and access to reliable and affordable electricity in rural areas has the potential to improve the provision of social services such as health and education. Switching to electricity can also help avoid a significant amount of environmental, health burdens associated with traditional fuels. Where infrastructure such as roads, water supply systems and social services are available in rural areas, electrification can result in direct economic benefits (WEC, 1999). Potential benefits of electricity in rural areas include crop irrigation, agro-processing and preservation of farm produce.

Rural areas are usually characterised by low population densities with scattered clusters of premises usually inhabited by poor communities particularly in developing countries. Consequently, rural electricity supply systems are characterised by dispersed consumers, low consumption and low load factors (Zomers, 2001). Rural areas are usually served by long overhead lines that are susceptible to adverse weather conditions resulting in poor quality of supply. Because of the long distances involved in connecting new customers, the installation costs per customer are usually higher than in urban areas. Rural electricity supply systems could be connected to the national grid or be decentralised. Decentralised systems may be based on generation of electricity using diesel generators, solar power, small-scale hydropower, wind turbines or biomass gasification technologies.

Electrification of rural areas has progressed at low rates mainly due to high costs associated with extending electricity grids and developing decentralised systems. In developing countries, rural electrification (RE) has also been affected by poor policy, institutional weaknesses and limited financing. Dispersed low-income consumers and low demand for electricity in rural areas results in lack of interest among private electricity supply companies to service such areas. As such, RE has traditionally been done by state-owned power companies that have depended on economies of scale to cross-subsidise RE activities. Unfortunately, most state-owned companies in developing countries have been experiencing financial constraints mainly due to limited revenues and difficulties in sourcing finances from financing organisations.

The emerging of power sector reforms such as commercialisation, structural changes and privatisation, and the relative success of the reforms in pioneer countries stimulated adoption of similar reforms in many countries (Wamukonya, 2003b). Further, financing institutions such as the World Bank believed that the reforms could help improve technical and financial performance of the power sector and as such, started incorporating conditions for reforms in lending agreements (World Bank, 1993). The need for financing and in some cases conviction that the reforms would bring about improvements resulted in a large number of developing countries taking steps to reform their power sectors in the 1990s.

This paper analyses among other factors, the influence of the PSR on RE and outlines the policies and strategies required to support RE in a reforming or reformed power sector.

2 POWER SECTOR REFORMS AND RURAL ELECTRIFICATION

2.1 Power Sector Reforms

In the 1970s, the power sector was characterised by state ownership and monopolies. It was then believed that a single national utility operating as a monopoly was supportive to electricity system development and the rights of people to low electricity prices. It was thought that this structure would facilitate expansion of power supplies, capture economies of scale, and ensure effective use of scarce managerial and technical skills (World Bank, 1993). This was the foundation of most of the vertically integrated state monopolies in most countries by the start of the 1990s. However, most of the state-owned companies started experiencing financial problems mainly due to inappropriate pricing policies and poor operating performance due to lack of qualified and experienced personnel. The companies also experienced significant interference in their operations from governments. Politicians influenced employment policies resulting in over-employment and low labour productivities. Meanwhile, most developing countries, continued to experience limited access to electricity particularly in rural areas. Lack of financial resources from both the utilities and the public sector resulted in limited investment in system development and maintenance (Kessides, 2004).

Poor performance of the power sector in most developing countries in the early 1990s on one hand and success of the newly implemented power sector reforms in the pioneer countries, Chile and United Kingdom (England and Wales), on the other hand stimulated the need for reforms. The reforms are based on market theories whereby electricity is treated as a commodity as opposed to the long-standing view that electricity is an integrated service (Byrne & Mun, 2003). Generally, the reforms amount to structural changes and/or privatisation. Structural changes include vertical and horizontal unbundling or mere separate accounting of segments of power supply. Vertical unbundling entails creating separate entities for electricity generation, transmission and distribution/supply. Horizontal unbundling mainly involves breaking up of large national distribution entities into regional distribution companies. Privatisation includes ownership changes, contracting out, hiving off and internal independence of management. Corporatisation and Commercialisation whereby publicly owned utilities are made to operate under commercial laws and principles are essentially forms of privatisation.

The need for co-existence between private and commercialised state-owned companies in a reformed power sector necessitates the establishment of independent regulatory bodies to replace ministerial or government department regulation. Regulators are charged for both social regulation dealing with matters of health and safety, environmental protection and consumer protection and economic regulation triggered in the absence of sufficient competition. Social regulatory instruments include; permits, mandatory standards, information disclosure and, economic incentives or sanctions. Economic regulatory instruments include price and quality regulation. Under reforms, private and commercialised utilities tend to maximise profits. In an environment of competition, the various players will regulate their own conduct resulting in fair pricing and provision of quality services. In the power sector, competition is only possible in generation and supply and therefore regulation is necessary to moderate the conduct of the players in network services.

In industrialised countries, reforms were mainly driven by the need to introduce choice of supplier, to facilitate competition, improve quality of service and to lower electricity prices. Reforms were also facilitated by technological advances such as the development of efficient combined cycle plants and distributed generation. In developing countries the reforms were driven by the need to improve technical and financial performance, promote investment in system development and to reduce political interference in tariff setting and utility management (Bhagavan, 1999).

2.2 Power Sector Reforms and Rural Electrification Causality – Theoretical concepts

A review of literature (World Bank, 1993; Bacon & Besant-Jones, 2001; Wamukonya, 2003a; Bhagavan, 1999; Ranganathan, 1992; Kessides, 2004) reveals that proponents of PSR such as the World Bank argue that PSR would bring about improvements in the power sector thus availing more resources to RE. Liberalisation would introduce new private players in the market with potential for competition, increased investment and introduction of new management and technical skills. Unbundling enables transparent costs, which facilitates the wholesale trade of electricity between generators and suppliers to rural concessionary areas. Further, the need for profits among private suppliers and commercialised utilities could stimulate innovations particularly in the approach to rural electrification and the application of cost-effective technologies.

With regard to regulation, proponents of reforms argue that independent regulation of the power sector facilitates transparency, public participation and fair rules for all stakeholders. Reforms further provide an opportunity for policy makers to change institutional arrangements that have failed to facilitate increased access to electricity in rural areas in the last two decades. For instance, utilities as agents for RE have limited capacity to integrate RE with end-use demand enhancing components such as agricultural extension services, business development and social services. Since rural areas require a more broad view to energy planning, reformers support the need for establishing dedicated RE authorities. RE authorities would be more prudent in the management of RE resources and it would be easier to “ring-fence” RE finances in an environment where government could divert the resources to other priority programmes.

However, opponents of reforms argue that liberalisation and unbundling could fragment the market leading to loss of economies of scale and scope required for system expansion to rural areas. In addition, liberalisation could increase bureaucracies and transaction costs for rural electrification projects. Commercialisation, privatisation and independent regulation could lead to increased tariffs. Commercialised and/or privatised utilities are also not interested in supply of electricity to non-profitable rural areas.

A summary of the perceived benefits/setbacks of reform on RE is given in Table 1.

Table 1: Theories on the Causality of Power Sector Reforms on Rural Electrification

PSR Measure	Anticipated Effect	Anticipated Benefits to RE	Possible Setbacks to RE
Liberalisation	<ul style="list-style-type: none"> Increased players in the market Fragmentation of electricity industry 	<ul style="list-style-type: none"> Potential for increased investment and coverage due to competition for the market New players could introduce new skills and capabilities 	<ul style="list-style-type: none"> Loss of economies of scale and scope Increased transaction costs
IPP	<ul style="list-style-type: none"> Competition in generation 	<ul style="list-style-type: none"> Competition could lead to lower electricity prices 	
Vertical Unbundling	<ul style="list-style-type: none"> Separation of generation, transmission and distribution 	<ul style="list-style-type: none"> Transparent costs between generation, transmission and distribution/supply 	<ul style="list-style-type: none"> Possible removal of cross-subsidies Loss of economies of scale and scope
Horizontal Unbundling	<ul style="list-style-type: none"> Distribution/supply divided into regional systems Electricity activities are separated from other services (e.g. water)) 	<ul style="list-style-type: none"> Increased liaison with region and local development agents Utility company is more focused to electricity supply (when separated from other services such as water and telephones) 	<ul style="list-style-type: none"> Loss of economies of scale and scope required for system expansion Removal of cross-subsidies with other services Reduced revenues for utility company
Commercialisation & Privatisation	<ul style="list-style-type: none"> Transfer of RE to non-utility government agent or Department High electricity tariffs Increased revenue collection by utility 	<ul style="list-style-type: none"> More priority is given to RE by emerging RE authorities Easy to integrate RE with Rural Development Opportunity for adopting new approaches to RE Increased finances for RE where consumer levies are used as source of funding Profits from commercialised utilities could be directed to RE Availability of financial resources for system expansion and maintenance 	<ul style="list-style-type: none"> Reduced demand and usage of electricity due to higher tariffs Limited focus on unprofitable rural areas by utilities
Independent Regulator	<ul style="list-style-type: none"> Regulatory oversight 	<ul style="list-style-type: none"> Facilitates open and transparent processes and public participation Ensures supportive entry and exit rules Balances interests of rural consumers, utility and government Ensures non-discriminatory, open access to the network Ensures fair and optimal costs for rural consumers Regulator can help promote appropriate technologies by the right pricing signals (supportive pricing arrangements) Ensures that efficient gains are passed to rural consumers 	<ul style="list-style-type: none"> Potential for competing for financial resources (Regulation and RE could have common source of funding) Over-expectance of protection by rural consumers

Source: Compiled by the Author based on World Bank, 1993; Bacon & Besant-Jones, 2001; Wamukonya, 2003a; Bhagavan, 1999; Ranganathan, 1992; Kessides, 2004.

2.3 Impact of Power Sector Reform on Rural Electrification

2.3.1 *Implementation of Reforms*

By the year 2004, nearly all developing countries had implemented PSR Latin America taking the lead with most of the countries implementing reforms in the 1980s and early 1990s (GNESD, 2004). The initial reforms had a strong market orientation with social issues such as RE being largely sidelined. The eventual realisation of the need to cater for RE within the context of reforms led to innovations. For instance, despite implementing market reforms in which the state-owned power company was unbundled and sold to the private sector the 1980s, it was only in 1994 that Chile launched a comprehensive RE programme. This involved setting up a special fund from which a one-off subsidy was given to private distribution companies to cover investment costs for RE (Jadresic, 2000). Similarly, Argentina initiated reforms about 1990 and privatised the power companies in 1992/93. It was only in 1995 that the country implemented a far-reaching programme for electrification of isolated rural areas (Bouille, Dubrovsky & Maurer, 2002). Implementation of reforms in Peru and other Countries in Latin America took similar trends. In general, comprehensive RE programmes in Latin America followed initial market reforms in the power sector.

The reforms in Sub-Saharan Africa have been quite diverse with some countries taking significant measures while others were more cautious and slow to reform. Karekezi & Kimani (2002) observe that over 20 African countries had initiated PSR by 2001. Kenya implemented major reforms in 1996 by unbundling the state-owned power company into separate corporate and commercial entities. By 2001, four IPPs had entered the Kenyan power market and the country had established an independent regulatory body. However, Kenya did not establish an autonomous RE agent prior to the reforms (Nyoike, 2002). In Senegal, the reform strategy was to privatise the state-owned utility, introduce IPPs, establish an independent regulator and to set-up an autonomous RE agent. The reforms were preceded by relevant legislation in 1998. However, despite the country's desire to privatise, the process failed on account of limited interest by private investors (Wamukonya & Fall, 2003; ENDA – TM, 2004). Zambia enacted new laws to liberalise the power sector and to establish an independent regulatory body in 1995. By 1997, the country had privatised parts of the distribution system and established the regulator. While RE was part of the initial reform programme through the setting up of a RE fund in 1995, a dedicated RE agent was only established in 2003 (Haanyika, 2004).

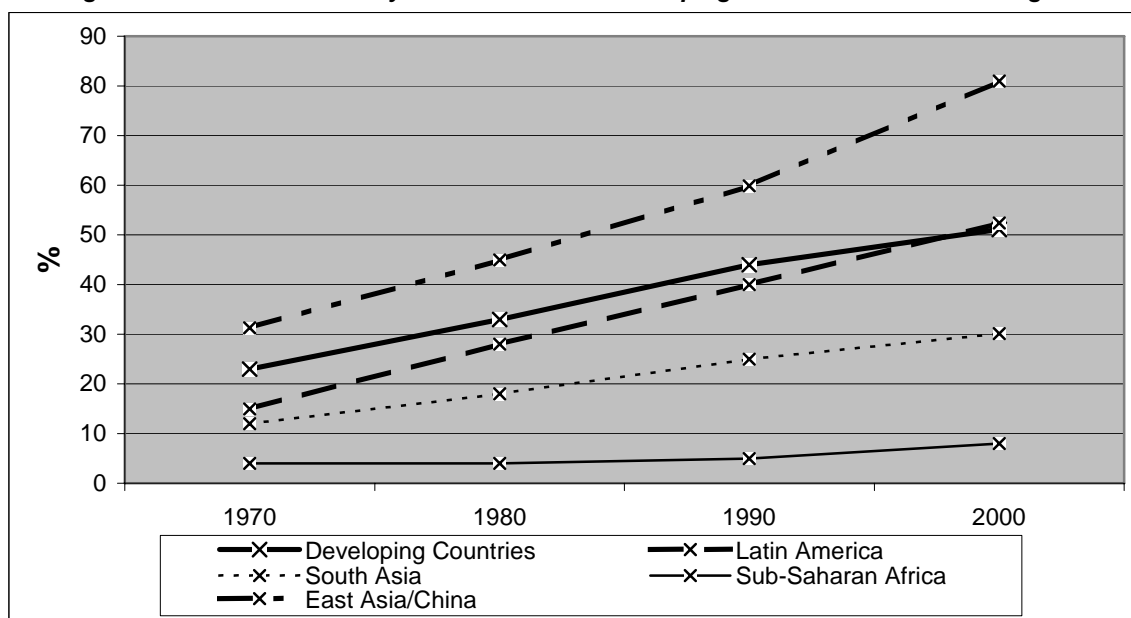
In South and South-East Asia, countries that had implemented significant reforms include India, Indonesia, Malaysia, The Philippines, Singapore, Vietnam and Thailand. Nearly all the countries had restructured, corporatised, privatised and set up independent regulatory bodies. However, only a limited number of countries had introduced competition. With regard to RE, it is evident that countries in Asia long recognised the need for expansion of electricity services to rural areas and by the time of implementing market reforms, most of the countries had established electrification bodies with supportive legislation (TERI, 2004). In Thailand for instance, a dedicated RE office was established within the Provincial Electrification Authority (PEA) leading into the implementation of a 25-year "National Plan for Accelerated Rural Electrification" in 1974 (AIT, 2004). In the Philippines, electrification had been a major policy objective since 1960 and the Electricity

Administration (EA) was responsible for awarding private franchises for distribution of power in rural areas. In 1969, the EA was replaced by the National Electricity Administration (NEA) and designated as the implementing agent for RE. With PSR in 2001, an independent regulatory commission was established and mandated for RE and ensuring the protection of poor consumers and collection of electrification levies (TERI, 2004).

2.3.2 Expansion of Access

According to GNESD (2004), 27% of the world population had no access to electricity in 2000. This accounted for at least 1.6 billion people. Over 99% of the people without electricity lived in developing countries where only 51% of those in rural areas had access. In Sub-Saharan Africa, a meagre 8% in rural areas had access to electricity. The rate of rural electrification was also very low. For instance, the WEC (1999) indicates that rural access to electricity in Sub-Saharan Africa in 1970 was 5%, only increasing marginally in 30 years to 8% in 2000. Figure 1 shows the electrification levels in rural areas of different regions of the world.

Figure 1: Access to electricity in rural areas for developing countries and selected regions



Source: World Bank, 1996; GNESD, 2004; Zomers, 2001; ABB, 2003.

In Latin America, studies by Jadresic, Covarrubias & Reiche and ESMAP show that Peru, Argentina and Chile made significant increases in RE levels following implementation of reforms. For instance, Chile increased access to electricity in rural areas from 53% in 1992 to 76% in 1999. The achievement is attributed to the RE programme the country launched in 1994 and described in Section 2.3.1 above. The RE programme in Chile was based on; decentralised decision making and local participation, public-private partnerships, competition and the use of appropriate technologies (Jadresic, 2000). Argentina launched a programme to give concessions for rural off-grid systems by competitive bidding. For example, a concession for off-grid electrification for the province of Jujuy resulted in the installation of photovoltaic systems in 556 homes and 43 schools in 1999 (Cavarrubias & Reiche 2000). In the case of Peru, RE levels increased from 5% in 1993 to 20% in 1997 (ESMAP, 2001) mainly due the high level of integration of RE and rural development.

Case studies on electrification in Africa by GNESD (2004) show that market oriented reforms affected the rate of RE negatively. For instance, the RE rate in Kenya reduced from 16.1 % in 1993 to 7.7% in 2001. Overall access to electricity in Kenya was 5.5% in 2001 while access in rural areas was only 0.8%. In Senegal, access to electricity in rural areas increased from 5% in 1996 to 8.3% in 2001. Zambia recorded no significant improvement in the level of access to electricity in rural areas between 1990 and 2000 and the access level remained at about 2% (Haanyika, 2004). On the other hand, South Africa using a somewhat different approach to electrification managed to increase electrification levels from 36% in 1994 to over 66% in 2001. The country used the electricity regulator as the electrification agent and the main public utility as the executing agent.

In most Asian countries, measures taken alongside or before reforms helped to widen access to electricity. In the Philippines, the reform measures facilitated continued electrification with the RE rate increasing from 2% prior to 1998 to 3.5 between 1998 and 2002. The market reforms initiated in 1992 in Thailand did not seem to affect the rate of RE. RE had since 1974 been managed by an Office of Rural Electrification set up specifically for the purpose and specifically designed measures helped increase electrification levels from about 15% in 1970 to over 98% in 2000. The measures included the implementation of an Accelerated Rural Electrification (ARE) programme based on a Master Plan initiated by the Provincial Electricity Authority (PEA) in 1997. In Vietnam, the establishment of a special office for RE in 1995 helped increase the level of access to electricity in rural areas from 50% in 1993 to 77% in 2001 and the RE rate from 2.1% to 9.9% during the same period (AIT, 2004).

2.3.3 Affordability

Market reforms and in particular commercialisation are refocusing the interest of public utility companies to increasing revenue and profitability, as is the case with private companies. This means that companies increase tariffs and implement vigorous measures to collect revenue. Under these circumstances, consumers are forced to reduced consumption to affordable levels. For instance, in Argentina, the lifeline tariff was increased from 4.5 USc/kWh in 1989 to 11.77 USc/kWh in 2001. Various tariff measures resulted in an increase in the expenditure on electricity as a percentage of household income for rural consumers from 2.7% in 1986 to 4.2% in 1997. In Peru, increases in tariffs from 6.8 USc/kWh in 1990 to 17.2 USc/kWh in 1994 resulted in a reduction in household consumption from 136 to 106kWh/month (Fundación Bariloche, 2004).

AFREPREN (2004) indicates that following the implementation of reforms in Kenya, electricity tariffs were regularly increased. In 1993, the tariff for rural areas stood at about 4.2 USc/kWh. However, this increased to 7.8 USc/kWh in 2001. In response to the increases, the household consumption decreased during the period from 142 kWh/month to 75 kWh/month. In Senegal, tariff increases were minimal and the per capita consumption increased following reforms (ENDA – TM, 2004). In Zambia, electricity tariffs increased by over 400% between 1996 and 2000 i.e. an average of 100% per year (Haanyika, 2004). Similarly, utilities in Ghana increased electricity tariffs by about 300% in 1998 and reduced the lifeline band from 100 kWh to 50 kWh per month (Wamukonya, 2003c).

As part of the reforms, Thailand implemented a tariff-restructuring programme that resulted in a gradual increase of electricity prices between 1990 and 2000. For the lower category of consumers (rural consumers) tariffs increased from an average of 5 to 8.5 USc/kWh. However, the increase did not seem to affect the per capita consumption and the expenditure on electricity in relationship to household income (AIT, 2004). In Vietnam, tariffs were increased to meet conditions of the loan from the Asian Development Bank for an electrification project. However, measures were put in place to protect the rural consumers compared to urban consumers. As such, tariffs for rural areas only marginally increased from about 3.2 USc/kWh in 1996 to 3.5 USc/kWh in 2002. Per capita consumption increased by 17% per year for the rural consumers compared to 14% by the urban consumers during the period 1992 to 1998. With regard to expenditure on electricity in comparison to household income, the rate increased from 1.08% in 1993 to 3.0% in 1998 (AIT, 2004).

2.3.4 Financing

Public financing, donor support and state-owned utility finances were traditionally the main sources of RE funds while private financing has been limited. With financial constraints confronting most developing countries, governments have faced difficulties allocating financial resources to RE. Similarly, the commercialisation and privatisation of state-owned companies has limited availability and allocation of utility funds to RE. However, reforms have somewhat facilitated increased private investment and donor support. In addition, higher tariffs have helped increase financial resources for RE where funding is by way of consumer levies. Bacon & Besant-Jones (2001) indicate that involvement of the private players somewhat increased private financing in the power sector. Similarly, Kessides (2004) shows that developing and transitional economies experienced an increase in annual private investments in electricity projects from US\$1.3 billion in 1990 to US\$48.7 billion in 1997 with most of the investments going to early reforming countries in Latin America. Although the financing may not have been directed to RE, funding to increase generation and transmission capacity ultimately facilitates grid based RE. Under reforms, donors have been more supportive and more willing to inject financial resources in the power sector based on the understanding that reforms would improve performance. However, it is evident that public subsidies will continue to play a major role in RE. Subsidies that are applied in an innovative way and are accessible to both public and private power companies could help in expansion of access. Another potential benefit of the reforms to RE is that the emerging RE authorities are better positioned to protect or ring fence RE funds and limit diversion to other competing needs.

In Latin America, Chile provides some lessons in the financing of RE particularly the application of subsidies within the context of reform. Once the country had embarked on wide-scale RE, financing mechanisms were reviewed leading into a strategy that involved more stakeholders. Prior to 1994, RE was funded by allocations from the central government. RE had to compete with health, education and infrastructure development for allocation of resources. In 1995, Chile established a special RE fund, which was allocated to regional governments, based on the performance of the regional programme in the previous year and the number of dwellings still without electricity. From then onwards, RE financing was based on the principle of shared responsibility. New customers were responsible for in-house wiring, procurement of

the electricity meter, connection to the grid and payment of a regulated electricity tariff. Distribution companies covered part of the investment and operated the completed project while government provided subsidies on investment. Government subsidy was provided to an extent or level that allowed distribution companies earn an agreed return on investment. The new mechanism enabled the government to reduce the share of investments in RE in comparison to the private sector from 70% in 1992 to 61% in 1999 (Jadresic, 2000). Although not discussed in detail in this paper, similar examples of innovative approaches in the financing of RE are found in Argentina and other countries in Latin America.

Social and economic equity was a main part of South Africa's public benefits agenda. As such, equitable access to electricity was a major consideration in the country's electricity reform process. As part of the PSR, South Africa instituted an electrification programme that was funded mainly through cross-subsidies and a consumer levy by the country's main utility, Eskom and the municipalities (Philpott & Clark, 2002). The National Electricity Regulator (NER) was responsible for management and administration of the RE fund and allocated subsidies to electrification concessionaires, set prices and regulated the performance of the companies. With this approach, South Africa was able to increase the level of access to electricity from 40% in 1994 to 66% (46% rural, 79% urban) in 2002. In other African countries, RE was mainly financed by government subsidies. However, increased donor support was experienced in many African countries such as Uganda and Zambia following reforms. With support from the Swedish Agency for International Development (SIDA), Zambia established some Energy Services Companies (ESCOs) that supplied electricity to selected rural areas using solar PV systems (SEI, 2001).

In Asia, RE continued to be financed through government subsidies even after reforms. However, the private sector also played a role with support from governments. In Thailand for instance, the government funded RE through the Office for Rural Electrification (ORE) established under the Provincial Electricity Authority (PEA). There were also significant cross-subsidies between urban and rural consumers. In addition, there were other programmes such as the Normal Rural Electrification (NRE) programme, which allowed villagers to contribute cash, or in kind towards accelerating their connection to the grid (AIT, 2004). In Vietnam, the Vietnam Women's Union (VWU) received grants from a number of donor organisations and created a revolving fund that enabled the members to be supplied with Solar Home Systems (SHS). The women were allowed to pay for the systems over a period of three years (CORE, 2002). The cases in Thailand and Vietnam both highlight the potential roles of communities in financing RE.

2.4 Key Findings

Key lessons from implementing reforms in developing countries are that the market reforms are not by themselves supportive to RE and therefore deliberate measures prior to or during reforms must be taken to ensure continued electrification. Reforms call for segregation of commercial and social functions in the supply of electricity. While state-owned companies could continue to play a significant role in implementing RE programmes, it is important that the commercial and social functional areas are clearly separated to facilitate the effective allocation of subsidies.

Following reforms, there was an increased private investment in the power sector particularly in Latin America. Whereas there were instances of reduced electricity tariffs in some countries, generally tariffs were increased. In most instances, reforms resulted in the reduction of RE rates and lower electricity consumption levels. Clearly, market reforms are not designed to specifically deal with problems of RE confronting many developing countries. In an environment of PSR, improvements in RE call for different and innovative approaches. Enacting appropriate laws and creating institutions to specifically deal with RE and protection of the poor are some of the measures that have facilitated both expanded access and affordability of electricity in rural areas. In nearly all countries, studies indicated that subsidies were an important aspect of RE. However, different approaches were observed in the application of subsidies. Lessons are that subsidies need to be carefully targeted and preferably applied in capital investment to expand access.

3 POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

3.1 Policy Considerations

Some of the problems affecting the expansion of electricity supply systems in rural areas have been highlighted in earlier sections of this paper. These include limited financing, limited application of appropriate technologies, poor management and more importantly, poor policies and weak legal/institutional frameworks. Based on experiences in many developing countries as above, it is evident that development of national strategies for RE in an environment of reforms in the power sector is necessary. The strategies should be directed towards minimising the problems affecting system expansion. Further, measures should be put in place to ensure sustainability of rural supply systems. Sustainability measures should be aimed at facilitating affordability of electricity and also enhancing demand. Other strategies include protection of both rural consumers and suppliers alike and facilitating further investments. RE policy should be gender sensitive and take into account the needs of both men and women. From a social perspective, it should be noted that women and children play a major role in the availability of energy in households.

3.1.1 Financing

The situation of high electricity supply system development costs, low demand/consumption and limited affordability earlier alluded to, renders rural electrification largely unprofitable and thus unattractive particularly to private investors. These factors call for both innovative technologies and financing mechanisms to enable profitability and sustainability. Clearly, public financing alone would be far from adequate to meet rural electrification needs of most affected countries while private financing would be limited due to high investment risks compounded by low profitability. Appropriate financing mechanisms would therefore call for a combination of both public and private financing in a symbiotic relationship. This public-private partnership could be in a form whereby public finances are availed for guaranteeing private financing or in a form of capital subsidy on private investment in rural electricity systems developments. Whereas direct consumption subsidies should evidently be discouraged, public finances should be directed towards supporting electricity demand and income enhancing activities in applicable rural areas. This includes development of infrastructure such as roads, water supply

systems and social services. Public financing should also be used to support employment creation and skills training in applicable areas. Further, in any public-private partnership, the cost of public funds should take into account environmental and health related problems associated with traditional forms of energy to be substituted by electricity. In general, public financing for RE and associated activities should be considered within the framework of rural development.

Whether public or private financing, the challenge lays in securing the finances for RE. Both public bodies charged with the responsibility of raising funds for RE and private entities interested in investing in rural electricity businesses need to apply innovative but less risky approaches. Common public approaches include mandatory consumer levies though unpopular with consumers already paying taxes to government. Private players are faced with many more opportunities although some are rather unconventional and difficult to materialise. Private options include Investment Banks, local entrepreneurs and equipment suppliers with secondary interests of supplying RE equipment. On the consumption end, the role of micro financing, consumer credits and revolving funds could be considered. Donor support is usually available for socio-economic considerations. However, care should be taken by affected countries to avoid the now common donor dependency syndrome affecting most RE programmes as observed by Ranganathan (1992).

3.1.2 Appropriate Technologies

Conventional electrification has for a long time focused on grid extensions. However, in cases of large countries with dispersed major electricity generation plants, grid extension has proved rather costly. In addition, the management and operations of large and integrated power systems call for high levels of technical and management skills not readily available in developing countries currently facing rural electrification problems. Further, when supplied from large power systems, small rural consumers could easily be considered as a nuisance and would not attract the attention of system operators even in a regulated environment. Large power system operators are dependent on economies of scale as opposed to scope and therefore, when involved and given choices in RE, the companies tend to focus on grid extensions (Ramani, 1992) even where non-grid technologies such as mini-hydro, biomass gasification, etc are technically viable, economically feasible and environmentally more friendly. Clearly, there is need to support RE through research and development in appropriate technologies, skills training and dissemination of information on alternative technologies.

If RE is going to be more economical and sustainable, low cost technologies that depend on rural skills must be embraced. Whereas some technologies such as solar photovoltaic are still in their maiden stage and therefore expensive, mini-hydropower, wind turbines, biomass gasification and biogas have matured and are being used to generate electricity for supply to mini-grids in rural and remote areas. These so-called “decentralised technologies” have in most instances proved cheaper and more appropriate than national grid extensions when used in rural electrification. Because of the size of decentralised systems, management and operational skills requirements are less stringent and local communities using local skills have in several instances operated the systems. Based on experiences in a number of developing countries, the use of decentralised technologies should be promoted.

At the household level, the challenge is to implement low cost technologies in house wiring and the use of energy efficient equipment to facilitate affordability and wide use of electricity. Such technologies include; “Ready Boards” and pre-paid metering systems. Whereas as one could argue that pre-paid metering systems limit demand usage needed for sustainability of rural supply systems, effective energy management helps to bring on board a diverse range of consumers and reduces metering, billing and settlement costs. Availability of low rate equipment such as 1kW instead of 2kW heaters enables less well-to-do rural dwellers to use electricity for heating. At the point of interconnection to the grid, potentially low-cost technologies such as “single wire earth return” and the use of “aerial bundled” conductors should be explored.

3.1.3 Management Capacity

RE management is required at two levels namely; the planning stage and at implementation. Planning includes aspects of project development and financing. This stage requires close liaison with policy makers and linkage with national and local development agencies for facilitate integration with rural development. Implementation requires resilience in ensuring that selected projects take-off, are commissioned and rural electricity supply systems operations are sustainable. Whether in a government department, responsible statutory body or within a utility company RE management play a significant role in executing RE programmes. As such, RE bodies should have staff well versed with electrification technologies, energy economics, project planning/development, socio-economic analysis and rural development. In addition to skills availability, RE management must be adequately mandated, capacitated and ready to face many challenges including political pressure. And since RE requires broad consultations and involvement, RE management must have capacity to develop linkages and to network with various stakeholders in government and the private sector alike.

3.2 Legal and Statutory Requirements

A legal/regulatory framework that facilitates both public and private interests should support policy. A comprehensive framework is essential taking into account that RE is mainly a social activity undertaken for the emancipation of rural people who without adequate and clean forms of energy risk being deprived of socio-economic development. Clearly, a non-regulated rural electricity market would result in uneven and unjust distribution of resources. Regulation facilitates health and safety, environmental protection and consumer protection necessary in a rural setting.

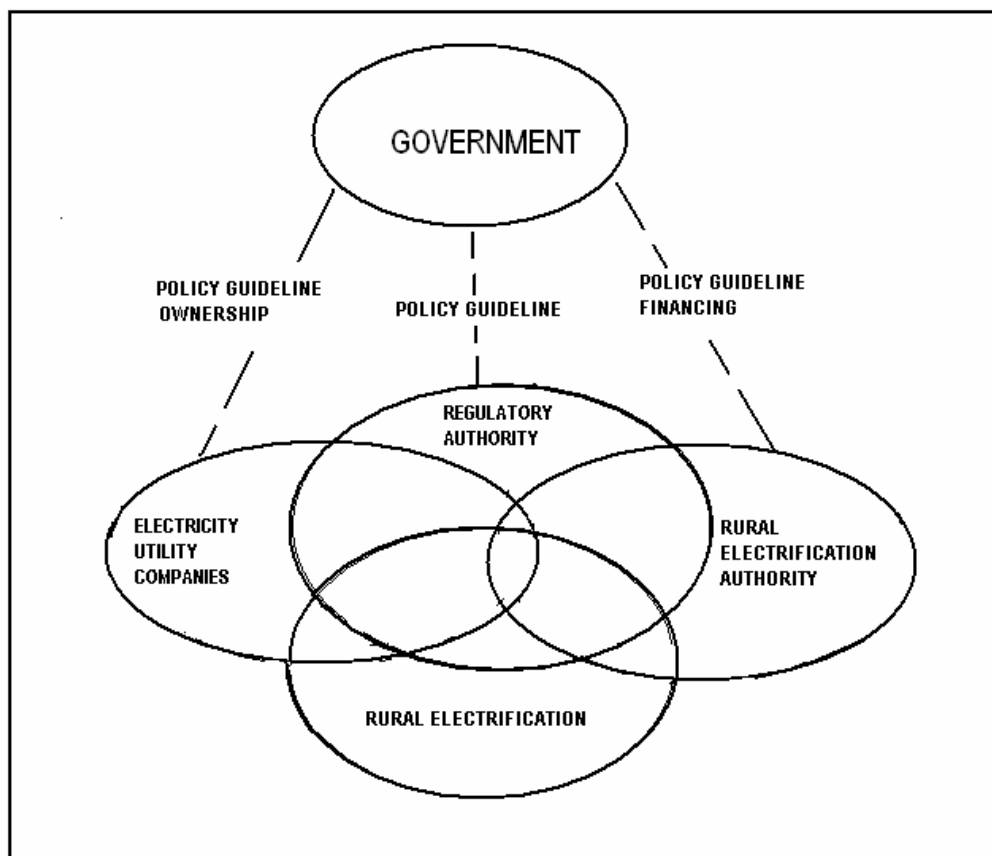
As experienced in some countries such as Zambia (Haanyika, 2004), funds for RE could easily be diverted to other equally pressing national needs. There is need therefore to protect such funding by provision of statutory instruments or other more stringent laws. Further, in order to ensure policy implementation and enforcement of statutory requirements, there is need for dedicated and focused institutions with a clear statutory mandate to take responsibility. Such bodies would ensure continuity and consistence even in instances of changes at political level. Statutory bodies are assumed to derive their authority from the people and therefore could make long-term decisions devoid of short-term political interests.

Experience also shows that countries that have made significant achievements in RE particularly those in Asia, enacted laws and set-up legal institutions to facilitate RE and to protect rural consumers particularly in an environment of power sector reforms. Key institutions established include regulatory bodies and rural electrification authorities.

3.3 Institutional Framework

With reforms, it is evident that governments, utilities and emerging RE authorities and regulatory bodies take the centre stage in the power sector in general and in facilitating and ensuring RE. In order for these institutions to operate effectively in the quest to expand access to electricity in rural areas, there is need for clear roles and responsibilities in both policy development and implementation. In the following sections, the paper attempts to prescribe key roles and responsibilities for the identified institutions while recognising the fact that many more stakeholders contribute to achieving expanded access and affordability of electricity in rural areas. Figure 2 shows the relationship between the identified main stakeholders.

Figure 2: Rural Electrification Institutional linkages



Source: Compiled by the author.

3.3.1 Government²

The main role of government in the expansion and affordability of electricity services in rural areas is to formulate policy and put in place a supportive legal/regulatory and institutional framework. In the process of policy development, the government must consult widely and obtain views from all major stakeholders including rural communities, non-governmental organisations (NGOs), the private sector, international financing institutions and the donor community.

Lessons from Latin America and Asia indicate that some of the policy measures supporting RE include the establishment of dedicated RE authorities and independent regulatory bodies. Governments must as far as possible, ensure that the RE framework enables both public and private utilities to contribute to expansion of services to rural areas while providing a quality and affordable service. Utilities must also be in a position to recoup their investment. It is of paramount importance that reforms are balanced with the social, economic and environmental considerations. Government policy and the legal/regulatory framework should ensure that regulatory bodies are truly independent so as to enhance objectivity in regulatory decisions and enforcements. Independence of regulators could be affected by; the legal status, method of appointment, stakeholder representation, funding mechanism, decision making process and reporting arrangements.

With RE confronted by issues of poverty, profitability of utilities and environmental considerations, it is quite evident that governments need to formulate policies that incorporate incentives for both private and public utilities to engage in RE. Governments must not merely facilitate, but be engaged in financing and/or subsidising RE activities. Therefore, the executive wing of government must ensure enough budgetary allocation to RE activities while the legislature must check and approve such allocation. If RE financing problems are to be resolved, governments must look beyond the power sector for funding. For instance, measures to attract local investors, banks and equipment suppliers must be put in place. These measures should include supportive statutory measures.

Experience in a number of countries has shown that there is significant potential for RE funds to be diverted to other government priority areas such as combating HIV and AIDS. While this could be somewhat justified, lack of electricity worsens the situation of the poor and sick who have limited capacities to collect wood fuels and are worst affected by indoor pollution. There is need therefore, to protect or “ring-fence” RE funds. This could be achieved by establishing independent statutory RE authorities that will not only secure existing funds but work towards raising further resources. Independent statutory bodies have also often received significant support from the donor community and international financing bodies.

The government can mobilise rural communities to participate in RE. Rural communities could for instance form cooperatives to mobilise resources and participate in ownership of Energy Services Companies (ESCO) in rural areas. Government policy should facilitate electricity demand enhancing activities such as agro-businesses and other small-scale business activities. Government must also ensure gender balance by facilitating involvement of both men and women in RE.

² In the paper, government refers to all arms including the executive, legislature and the judiciary

3.3.2 Rural Electrification Authority

In most developing countries, the concept of autonomous RE authorities is relatively new. However, in Asia, similar bodies played a key role in facilitating RE from as far back as the 1960s. In most developing countries in Africa, RE authorities or agents are being established following the commercialisation of state-owned companies that performed the functions in conjunction with government departments since the 1970s. The main function of these agents is to act on behalf of the government in planning, organising and financing of RE activities. This entails that the agents must manage resources, help build capacities for rural electrification within the agents and with other stakeholders and to prepare national rural electrification plans in conjunction with rural communities and rural development agents.

The rural electrification authorities must be guided by government policy and work in close liaison with utilities and regulatory bodies. RE authorities must work with regulators to design appropriate tariff structures and cross-subsidies for rural areas. Further, it is the role of RE agents to facilitate development and application of appropriate technologies through training and development of relevant skills. A key challenge for RE authorities is to improve financing. The authorities need to pursue new financing arrangements with various stakeholders and where necessary make recommendations to government to ensure that policies and legal/regulatory frameworks are supportive. RE authorities must collaborate with regulators and standards bodies to ensure that appropriate codes and standards are in place and that contractors and certification bodies are available to support RE.

In order to achieve the objectives of RE, the authorities must earn the respect and confidence of key stakeholders to act independently and objectively. This could mean standing up to pressure intended to meet short-term political aspirations. To win such respect, RE authorities must be professional and support RE projects based on set criterion it be socio-economic, environmental or equity considerations. To achieve these objectives, RE authorities should be supported by appropriate legislation and financing. Key stakeholders should also have adequate representation within the authority.

3.3.3 Regulatory Authority

While companies could regulate their own conduct in a competitive environment, a regulator is put in place to regulate the players who have a monopoly in their area of coverage. The regulator must balance the needs of the utilities with those of RE by ensuring open and transparent regulatory systems, approving tariffs and connection fees for new services and enforcing performance standards. In developing countries where levels of access to electricity are low, regulators face the challenge of facilitating expanded access and affordability. Regulators must therefore develop regulatory systems that promote increased investment in electricity generation and distribution systems. Regulators should also encourage development of decentralised rural supply systems, which can be managed by local communities. Further, regulators work with RE authorities to ensure that subsidies are effective and targeted to those that cannot afford the service, mostly rural consumers.

Electricity supply to rural areas largely depends on monopoly national or region grids. It is therefore the responsibility of regulators to ensure that rural consumers pay fair prices and receive quality services through effective regulation. Decentralised electricity system operators must be regulated because they are monopolies. Regulators ensure acceptable standards of service to rural consumers while allowing an acceptable return on investment to service providers. In addition it is cardinal that regulation helps integrate government policy and provide a consistent and transparent environment for investor confidence.

In order to achieve the above objectives, regulators must be innovative in addressing emerging problems, changing circumstances and in capturing and using new information. Regulators must protect consumers by responding to their concerns and ensuring that consumers participate in regulatory processes. Further, regulators must have in place regulatory systems and processes, which do not create barriers to entry particularly small-scale providers in rural areas.

3.3.4 Utility Companies

Market reforms change the way the companies are structured and relate to each other, to government and to consumers. Subject to set rules, companies can enter and exit the market place. Utility companies play a major role in RE through development and operations of rural supply systems or by transmission of electricity to rural areas. By investing in generation and network expansion, utilities are enabling access to rural areas. In the absence of adequate generation capacity and reliable networks, power would not be available to grid connected rural systems. Utilities can further influence the rate of electrification and the level of tariffs to rural areas by utilising least-cost electrification options and technologies. The companies could also be a source of skilled manpower to manage rural electricity systems.

Following reform, state-owned companies exist alongside private ones. With financial support in the form of subsidies, private or public utilities can compete for development and operation of rural electricity systems. However, to effectively conduct RE activities and receive appropriate public subsidies, utilities must ring-fence RE activities from commercially viable supply activities. When accurately estimated and correctly applied, capital subsidies could reduce the required return on total investments making rural businesses profitable. Coupled with some form of indirect subsidies aimed at facilitating demand and affordability, a number of private, public or even community players could be attracted to operating rural supply systems concessionary areas. In addition to the roles outlined above, utilities play a role in the financing of RE by collecting and remitting consumer levies where these form part of the funding mechanism for RE.

In summary, some of the key responsibilities for both private and public utilities in RE are to generate, transmit, distribute and supply electricity to rural consumers; to invest in electricity supply activities; to be innovative and as far as possible to apply low cost RE technologies and options. Utilities have a responsibility to accurately estimate required capital subsidies to ensure feasible and sustainable rural supply systems. Similarly, utilities play an important role in training personnel thus increasing technical skills among persons responsible for managing rural electricity supply systems and where required, to collect and remit government levies for RE.

Detailed responsibilities for RE activities in a reformed power sector are given in Table 2.

Table 2: Rural Electrification Institutions and Responsibilities

Type	Responsibility	Collaborators	Activities/Issues
Legal and Institutional Framework	Government	<ul style="list-style-type: none"> Rural Communities NGOs Private Sector International Financing Institutions Donor Community 	Policy Formulation
			<ul style="list-style-type: none"> Rural Electrification Power sector Reforms
			Legal and Institutional Framework
			Rural Electrification
			Establishment
			Mandate
Operational/Management Aspects	Public Agents	<div> <div>Rural Electrification Authority</div> <div>→</div> <div> <ul style="list-style-type: none"> Regulatory Authority Utilities </div> </div>	Management of RE resources
			Capacity building for RE
			Integrating RE with rural development
			Preparing country RE plans
			Financing of RE
			Develop and implement subsidy schemes for RE
			Recommend policies for RE
			Design mechanisms for developing rural electricity systems
			Development of RE technologies
			Development of subsidy schemes for rural consumers
			Promotion of decentralised electricity supply technologies
			Open and transparent regulatory process
			Balancing interest of consumers, utilities and government
			Obligation of utilities to serve all consumers
			Approving electricity tariffs and connection fees
			Enforcement of licence conditions
			Enforcement of performance standards
			Design mechanisms for operation of rural electricity systems
			Development of performance standards for rural systems
			Determination of fees for connection to rural electricity supply systems and to the regional or national grid
			Determination of electricity tariffs for supply to rural areas
			Transparent costs for generation, transmission and distribution/supply
			Billing and settlement procedures for rural systems
			Develop supportive entry and exit rules
			Develop licensing process for rural electricity operators
			Monitoring performance of rural electricity operators
			Investment in national and regional network expansion
			Provide non-discriminatory and open access to the network
			Investment in commercially viable electricity supply systems
	Utilities	<div> <div>→</div> <div> <ul style="list-style-type: none"> RE Authority Regulatory Authority </div> </div>	Collection and remittance of RE consumers levies
			Investment in RE
			Ensure optimum network costs and service levels

Source: Compiled by the author

4 CONCLUSION

It is evident that the market based power sector reforms significantly change the way RE has been managed. As part of the reforms, new private players are integrated in the power sector and state-owned utilities commercialised. The need to level the playing ground to facilitate co-existence between new players and state-owned utilities entails that independent regulation is introduced. Regulators must ensure consumer protection through price regulation and enforcement of performance standards. Commercialisation of state-owned utilities entails shedding off responsibility for RE which has largely been accepted as a social activity. Separation of RE from commercial activities has resulted in the formation of autonomous RE authorities. However, the ultimate challenge is for utilities to develop and expand existing electricity supply systems in both urban and rural areas in order to increase accessibility to electricity. Unfortunately, the need to get a reasonable return on investments make supply to rural areas unattractive. As such, governments must provide incentives mainly through subsidies to facilitate RE. Government subsidies should as far as possible be investment based as opposed to consumption subsidies. Other government measures could include integration of RE with rural development to ensure maximisation of the benefits of electrification and to facilitate increased electricity demand. In this regard, rural development should facilitate the development of rural businesses and complementing infrastructure and services such as roads, water supply, schools and health services. Government and other players responsible for RE must also adopt innovative approaches to financing and implementing RE programmes. This calls for wide stakeholder involvement from the public and private sectors. Communities must also take a greater role and responsibility in RE activities. For the new arrangements and responsibilities in RE to function effectively, clear policy and an effective legal/institutional framework must be established. Finally, RE requires concerted efforts by a cross-section of stakeholders not limited to the institutions and groups discussed in this paper.

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