Widening access in the context of Power sector reform – an overview of the institutional challenges in Africa

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ABBREVIATIONS AND ACRONYMS

AFR	-	Africa
AFREPREN	-	Africa Energy Policy Research Network
ANARE	-	l'Autorite National de Regulation du Secteur de l'Electricite
BcF	-	Billion cubic foot
BNETD	-	Bureau National d'Etudes Techniques et de Developpement
CIE	-	la Compagnie Ivorienne d'Electricite
CIPREL	-	la Compagnie Ivorienne de Production d'Electricite
DES	-	Decentralised Energy Services
DOE	-	(United States) Department of Energy
DRC	-	Democratic Republic of Congo
ECG	-	Electricity Company of Ghana
EDF	-	Electricite de France
EDI	-	Electricity Distribution Industry
ESI	-	Electricity Supply Industry
ESMAP	-	Energy sector Management Assistance Program
ETU	-	Electricity Transmission Utility
FNEE	-	Fonds National de l'Energie Electrique
GDP	-	Gross Domestic Product
GHG	-	Green House gases
GOG	-	Government of Ghana
GPE	-	Groupe Projet Energie
GRIDCO	-	The National Grid Company
GSPER	-	Groupe Special Programme Electrification Rurale
HEP	-	Hydro Electric Project
IDA	-	International Development Assistance
IPDs	-	Independent Power Distributors
IPP	-	Independent power Producers
KENGEN	-	Kenya Generating Company
KPC	-	Kenya Power Company
KPLC	-	Kenya Power and Lighting Company
MME	-	Ministry of Mines and Energy
MST	-	Million short tons
NED	-	Northern Electricity Department
NEDCO	-	Northern Electricity Distribution Company
NES	-	National Electrification Scheme
NGO	-	Non-Governmental Organisation
RE	-	Renewable Energy
RED	-	Regional Electricity Distributors
RET	-	Renewable Energy Technology
SADC	-	Southern Africa Development Community
SAPP	-	South African Power Pool
SHE	-	Self-Help Electrification
SOGEPE	-	la Societe de Gestion du Patrimonie du Secteur de l'Electricte
SOPIE	-	la Societe d'Operation Ivorienne d'Electricite
T&D	-	Transmission and Distribution

TAPCO	-	Takoradi Power Company
UEB	-	Uganda Electricity Board
VALCO	-	Volta Aluminium Company
VRA	-	Volta Region Authority
WAPP	-	West African Power pool
ZESA	-	Zimbabwean Electricity Supply Authority
ZPC	-	Zimbabwe Power Company

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Widening Access in the context of Power Sector Reform: An overview of the institutional challenges in Africa:

1.0 Introduction

The debate of access has occupied the platform of many discussions on the power sector within and outside the framework of power sector reform. Access to electricity must be predicated by its availability in a form that is desirable, i.e reliable, clean and affordable. Some of the barriers to a change in the energy use pattern of especially the poor are the replacement cost of electrically operated devices and in a number of cases the relatively high connection cost of electricity. With adequate education on the real cost of switching from biomass fuels to electricity, especially taking into consideration the health risks incurred in the use of the former and its translated cost implications and in many situations threat to life, these barriers could be lowered making this form of energy provision attractive.

The level of poverty and spectrum of political performance impacts significantly on access to electricity and the efficiency of operation of the sector and in turn impinges on sustainable development. Over-centralisation of development strategies in the cities at the near exclusion of the rural communities has its own influence in the general performance indicators that characterise Africa's status in this market. Furthermore demands such as health, family sustenance, access to education, proper road networks, transportation, general welfare and in many instances to a large extent defence, compete for the meagre economic resources available for social development and adds their own dimension to the prospects for improving the energy sector in many developing and non-industrialised countries.

Statistics quoted such as 17 % national access to electricity and 2-3% in rural communities across the African continent as well as 2 billion people without access to high quality electricity in developing countries compared to over 90 % coverage in most developed economies shows an unacceptable gap, which in many respects provides a performance indicator of the level of development between the two economies. It is arguable that the provision of high quality electricity is the vehicle of economic development and for the continent to show its determination to close these performance gaps it must seriously re-state its structures and enact pro-active policies with supporting fiscal provisions for producing this commodity.

The history and perceived role of the power sector during the pre-and post-colonial period was one of a service utility, for the efficient running of the administrative machinery. There was an apparent lack of structures for improving consumer access and best business practice as the fiscal support was present from the civil service. Significant activities towards reform of the sector were noticed in the 70's. One of the main drivers of this process was the donor/lending community complemented by the consumer demand for the service especially in countries with stable economies and a thriving private sector. The move towards liberalisation of the service industry, including the energy/power sector brought with it the establishment of institutional frameworks aimed at providing an efficient actualisation of the process.

Most power utilities in SSA were state-owned, vertically integrated structures viewed as primarily a service to the nation and a political expediency, without the framework to promote viability and efficient management. These inadequacies became accentuated with the growing attempts at

addressing the need for more efficient and business-like systems and a move towards corporatisation/commercialisation of the sector as a means of initiating reform.

Recognition of the deficiency in national capacities and financial capabilities in providing adequate power at an affordable cost and with a reasonable level of security, governments are now participating in regional integration of the power sector as seen by the power pools being implemented in the continent. This ushers an interesting trend that will foster regional trade and enhance a more business oriented sector with its attendant effect on access, system efficiency and sustainable development.

2.0 Overview of the power sector

Table 1 provides a summary of electricity generation capacity in Africa and the contribution to this activity by type. It is evident from this table that the largest plant type is thermal with 75.8% of the total, followed by hydroelectric plants. South Africa is the only nuclear generator in the continent contributing 2% of the total. The details of this information are quite revealing when the country profile is considered.

Table 1.0 Electricity generation in Africa 1997

Region	**Capacity(GW)**	**Share (%)**			
		Thermal	Hydro	Nuclear	Other
North	32.88	87.7	12.3	0	0
West	9.61	52.2	47.8	0	0
Central	4.34	8.9	91.1	0	0
East	2.76	33.8	63.5	0	2.7
S. Africa	43.83	81.2	14.6	4.2	0
Africa	**93.42**	**75.8**	**22.2**	**2.0**	**0.1**

Source : [DOE, Energy Information Administration, USA, 2000]

For example in West Africa, Nigeria produces over 61% of the total capacity of the sub-region's electricity, while in Southern Africa, South Africa produces 80.3% of that sub-region's contribution. The other sub-regions major producers are the Democratic Republic of Congo(DRC) with 73.5%, Kenya with 29%, Egypt with 50.5% in the Central, East and North sub-regions respectively. South Africa, Nigeria and Kenya together produce 61.7% of the continent's total capacity. The countries with the greatest share of electricity from hydro are Cameroon and the DRC in Central Africa, with 84.5% and 98.2% respectively, Burundi, Ethiopia, Rwanda and Uganda in the Eastern sub-region with 74.4%, 77.8%, 74.7%, 88.2% and 95.7% respectively. In the southern sub-region the main players are Angola, Malawi and Mozambique with 66.8%, 78.9% and 87.2% respectively while in the west African sub-region, Cote d'Ivoire and Ghana, with 76.3% and 90.3% respectively. The dependence on thermal power generation is significant in the North (87.7%), Southern (81.2%) and Western (75.8%) sub-regions with a continent's total share of 75.8%. [See Appendix A]

These figures however belie the matter of access as can be seen in Table 2 for some selected countries. If access is to improve, reform must be undertaken in many of the utilities in the continent. From Table 2 it is seen that North Africa stands significantly apart from the rest of the continent with an average of 85.5 % access. This figure averages 95.5 % if Morocco is not included. The rest of Africa averages only 14.4%. Various countries including South Africa, Ghana, Uganda and Zambia are net exporters of electricity, even though the access figures given are under 30%.

Fig 1. Sub-regional power generation by type

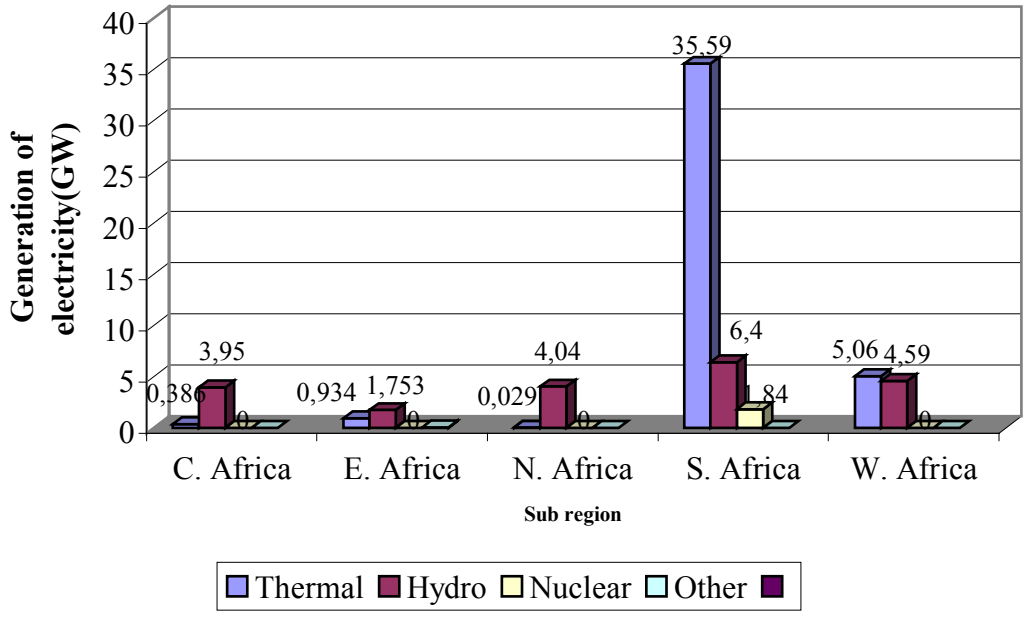


Table 2 Access profile in selected regions – 2000 Estimates

Region	Country	Estimated Population Millions	% Access
Central Africa	Cameroon	14.9	31.0
	Central African Republic	3.6	5.0
	Chad	7.7	3.0
	Democratic Republic of Congo	51.1	5.0
	Congo	2.9	5.0
	Gabon	1.2	5.0
Average Access(%)			**9.0**
East Africa	Burundi	6.8	5.0
	Eriteria	4.1	5.0
	Ethiopia	63.9	12.0
	Kenya	30.3	11.7
	Rwanda	8.5	5.0
	Sudan	29.6	5.0
	Tanzania	33.4	8.9
	Uganda	21.9	27.4
Average Access(%)			**10.0**
West Africa	Benin	6.2	22.0
	Burkina Faso	11.2	6.0
	Cote d'Ivoire	15.0	38.5
	The Gambia	1.6	5.0
	Ghana	19.3	35.0
	Guinea	7.4	5.0
	Guinea-Bissau	1.2	5.0
	Mali	11.2	7.6
	Mauritania	2.6	50.0
	Niger	10.8	7.9
	Nigeria	126.9	20.0

	Senegal	9.5	32.2
	Sierra Leone	5.0	5.0
	Togo	4.6	12.0
Average Access(%)			**17.9**
Southern Africa	Angola	12.7	5.0
	Botswana	6.2	22.0
	Lesotho	2.1	5.9
	Madagascar	15.4	11.1
	Malawi	11.0	5.0
	Mauritius	1.2	50.0
	Mozambique	17.6	5.8
	Namibia	1.7	20.2
	South Africa	42.3	66.0
	Swaziland	1.0	20.0
	Zambia	10.0	18.0
	Zimbabwe	11.9	20.0
Average Access(%)			**20.75**
North Africa	Algeria	30.9	96.0
	Egypt	63.2	96.0
	Libya	5.5	95.0
	Morocco	28.6	46.9
	Tunisia	9.6	95.0
Average Access(%)			**85.8**

Source : World Bank, 2000; DOE, USA

It is worth mentioning at this point that the challenges are not concerned with the lack of institutional structures in developing countries to ensure greater access and productivity in the sector, but in their inefficiencies and weaknesses. Most African governments have ministries handling the energy sector. However even with this institutional framework, the pre-reform state of the sectors in many of these countries was pedestrian and bedevilled with all the ingredients of struggling economies grappling with overwhelmingly competing developmental needs. One of the factors responsible for this poor performance is the dearth of adequate skilled professionals in the technical units of these ministries (where they exist) to shape policy that will translate to improvement in the sector's performance.

The institutional support required should target the following areas of concern :-

1. The business practices of the utililty
2. Increasing access to rural and peri-urban areas
3. Sound environmental policies for power generation
4. Promoting technology transfer for cleaner fossil fuel technologies and other options such as micro and pico hydro schemes[DFID, 2001].

The cost of electricity production and the high transmission and distribution losses in many utilities, poor macroeconomic and investment climates in the continent are some of the militating factors that stifle access and render the industry non-competitive with more traditional means of energy production and their attendant degradation of the environment and health implications.
The cost of grid-supplied electricity in urban areas ranges from 2-3 c/kWh (off-peak) to 15-25c/kWh (peak) [World Energy Report, 2000]. The tariffs computed from these production costs quite often are kept to a minimum because of government's intervention in the pricing mechanism

and their political commitment to the electorates. This is often a main cause of the inefficiencies of state-owned utilities and their inabilities to re-invest and expand access. Even though the actual costs passed on to consumers might be relatively cheaper than traditional fuels the gadgets depending on the use of electricity for the production of different forms of energy might be cost prohibitive for the low income earners. Thus the low tariffs benefit the richer consumers much more than their poorer counterparts. Put in its proper perspective the cost of energy paid by the poor is much higher in real terms than their wealthy counterparts because of the low rung in the energy ladder they find themselves and even when a leap-frog attempt is made in the energy transition the cost implications in purchasing more energy efficient equipment may be unattractive. Furthermore the externalities in using these low traditional energy efficient fuels in terms of health hazards, education of women and children and pollution are additional costs which are quite often not taken account of in the energy equation. The level of poverty engendered by these factors further adds to the inability of the majority of people especially in rural settings to access electricity.

3.0 Levers of the reform process

The following list provides some drivers of the reform process which are typical in a number of utilities and not exclusive of the power sector.

1. State-run utilities are usually inefficiently managed, even when these may have been transformed to parastatals due to political interference.
2. Lack of adequate funding over the years.
3. Unrealistic tariffs due to inadequate government subsidies and poor business practice in the management.
4. Poor reinvestment strategy and hence poor maintenance routines due to lack of spares, etc.
5. Low access figures. Table 3 shows that apart from South Africa with a rural household access of 27.2% and Cote d'Ivoire with a figure of 12.7% the rest of the countries highlighted have household access figures of 5% and less. The marked differences between the urban and rural figures are also significant to note and could be a reflection of differentiated development focus. Furthermore it can be argued that with the acceptance of power purchase agreements by governments the risks of the independent power producers are transferred to the consumers or the governments themselves as guarantees of purchase orders and pricing are embedded in the agreements. The need to recover investments as quickly as possible, provide some of the conditions of the agreement such as reserve capacity and penalties for non-supply within a given period, can also raise tariffs and increase the low income consumers inability to pay for electricity thereby further decreasing the access which may have been one of the original targets in the reform process.
6. World Bank conditionalities for accessing funding for sector reform.
7. Overstaffing. The international figure usually quoted is in the range of 150-160 consumers/employee. This figure reflects the performance efficiency of the utility. Quite often utilities in developing countries have figures of 40-100. Some examples are given in Figure 1.0 where it can be seen that Zambia, for example has 25%, Sierra Leone has a figure of 55, Lesotho, 12.5%, and the more efficient utilities such as South Africa and Mauritius showing figures of 106 and 123 respectively.

Table 3. Access to Electricity in a number of African Countries. Source ESMAP, 2000

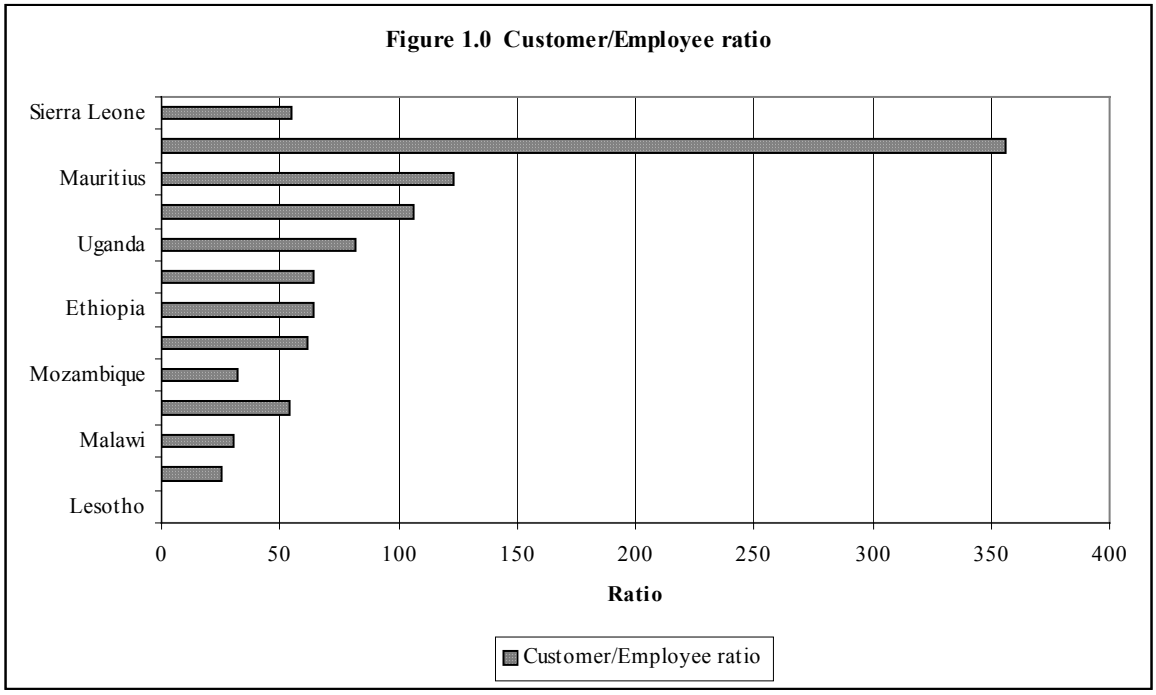
Country	Percentage of Households Electrified	
	Urban	Rural
Malawi	11.00%	0.32%
Tanzania	13.00%	1.00%
Lesotho	14.00%	4.00%
Mozambique	17.05%	0.66%
Zambia	17.85%	1.39%
Namibia	26.00%	5.00%
Botswana	26.48%	2.09%
Swaziland	42.00%	2.00%
Zimbabwe	64.72%	0.60%
South Africa	74.6%	27.2%
Cote d'Ivoire	73.1%	12.7%
Ghana	61.7%	4.3%
Average	**25.78%**	**1.70%**

8. Although high figures are desirable the wider employment picture should be considered in the context of the social structures operating in Africa. Indirect benefits are derived from each employee in the extended family system and this provides some social cohesion and sustainability. Furthermore many of these utilities have not incorporated computer assisted operations which would have meant a reduction of the number of workers performing some of the tasks. Also, simple tasks like cleaning of the floor, etc are carried out by full time employees as opposed to contractual agreements through outsourcing, practised in developed economies. Some of these social benefits and safeguards could be threatened by the private sector.
9. High technical and non-technical losses. Uganda, Sudan, Nigeria and Sierra Leone have figures of 30% or more, whereas more properly managed utilities such as Cote d'Ivoire, Ethiopia, Eriteria, and Kenya have figures just over 17% as indicated in Figure 2. The South African case is again exemplary quoting a percentage of approximately 6%. The non-technical losses are usually due to illicit connections meter tampering, and theft often in collusion with workers of the utility.
10. Low fuel efficiency due to old or ageing machines with significant derated output
11. Poor distribution networks, leading to high forced outage rates because of mismatch between generating and network capacities and brown outs due to transformer overloading in substations supplying distant communities.
12. Low availability. Technically this is defined as the ratio

$$\frac{MTBF}{MTBF + MTTR} \qquad 1.0$$

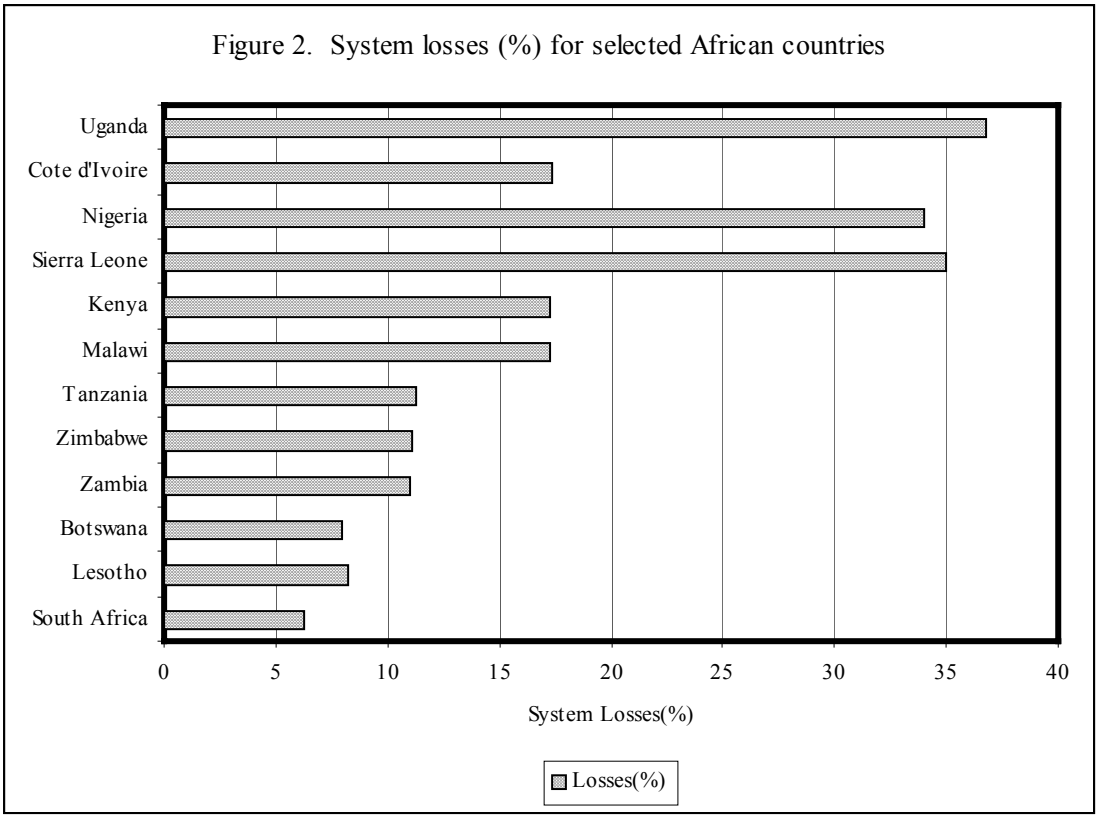
where MTBF is defined as the Average(Mean) Time between failures and MTTR as the Average(Mean) Time required to repair the machines on failure. For frequent failures and long repair times this ratio becomes increasingly small and highly undesirable. The MTBF is usually given by the reliability factor of the plant which is an inverse function of the failure rate. This factor is usually supplied by the manufacturers and cannot be affected by the operator. However the MTTR can be kept low by regular maintenance and adherence to the planned outage rate specified by the manufacturers, in order to keep the availability at a reasonably high value.

13. High suppressed demand due to a mismatch between demand and supply. This often forces the utilities to operate the plants at near or full capacity with strict load shedding regimes.
14. Severe natural disasters. For example, the experiences in Ghana and the Cote d'Ivoire after severe drought periods almost crippled their hydroelectric systems.
15. Concern for the environment.



Source : S. Karakezi and J Kimani, 2001 (Modified)

Some efforts at addressing these drivers are often made albeit in response to some crisis in the sector. This clearly is unacceptable and a coordinated and planned reform process cannot be replaced by such disparate crisis management. However even when some of these indicators are improved the matter of capacity must still be tackled as many utilities will not be able to meet the growth rates of the sector. It is evident from country statistics that additional capacities will have to be provided. The expected growth rate in Tanzania is 9% per annum for the period 2001-3, 6% during 2004-6 and 5.7% in 2007-15, requiring US$500 million investments in generation, transmission and distribution (World Bank, 2001b). In the case of Ghana a doubling of their growth rate is predicted in the next ten years which translates to a capacity requirement of 2000MW (Opam and Turkson, 2000) and an investment package of approximately US$1.5bn (Edjekumhene et al, 2001). The sector in Zimbabwe is expected to grow at 3% per annum for the next 10 years. This translates to approximately US$1.5-2bn (World Bank 2000e).



Source : Modified from S. Karakezi and J Kimani, 2001

Reform in energy use to improve access for sustainable development must also look critically not only on diversifying energy fuels for rural areas but a growing peri-urban population which is estimated to be 40% of the world's poor. The level of investment in providing electricity for these areas is much less than rural communities due to their relative proximity to the grid, and with more favourable demography. These areas are quite often the principal culprits however in illegal connection to the Low Tension cables and other activities which contribute to a high non-technical loss in the sector. The low consumption figures per household (13kWh/month to 200 kWh/month) makes these areas unattractive to the utilities. [Masse and Conan, 1996]

4.0 Institutional, Regulatory and legal framework

Many African countries have enacted laws governing the modus operandi of the power sector through their Parliament. Quite often these laws give the utilities sole responsibility for the generation, transmission and distribution of power and also provisions which make the utilities regulatory and licensing bodies as well. The sector is often supervised by a Board of Directors which in turn reports to the Minister. Some Boards have a mixture of directors from the government, engineering and manufacturing institutions and other representation from suppliers of electricity to the grid as seen in the case of Mauritius and Sierra Leone for example. The Management of the utility reports to and is supervised by the Board.

These structures in many cases have stifled competition and thereby encouraged inefficiency in the sector. Corruption in many areas of operation in some cases have further compounded the situation and contributed to poor fiscal discipline and consequently unimpressive performance spreadsheets. Lack of technical capacities in the Ministries have often meant a tacit acceptance of recommendation from Management which may itself have lost the confidence of consumers. There is therefore a need to set up competent professional/technical wings within the ministries to redress this undesirable incapacity to direct and fully manage the sector. Recent reform trends in

the continent have however provided a gradual turn-around in the fortunes of many utilities. In many cases the pathway taken for reform is determined by the donor or lending institution after mounting an independent study of the sector. In general a regulatory body must provide mechanisms for monitoring, supervision, areas of intervention, objectives and targets for development of the sector and financial and best business/industrial practice. The autonomy of such bodies depends on the expertise of its membership in legal and technical issues impinging on the sector as well as the government's willingness to recognize the authority of this body.

Other areas of consideration include :

- Encouraging participation of local investors in the reform process where the private sector is targeted. Involvement of local partners in the reform process can be a catalyst for providing s sense of ownership and a reduction in the resistance to change which might be encountered especially where replacement costs of old technologies and practices might be high as consumers move upwards in the energy ladder. There should also be a distinct effort to build local technical capacities in the service industry. The areas of distribution, supply and revenue collection are less capital intensive in terms of initial outlay cost than generation and transmission. Local entrepreneurs must therefore be encouraged to target these unbundled areas for investment.

- Careful consideration of renewable technologies in providing services to niche markets especially where there are no immediate plans for grid extension due to low load factors and uneconomic distances from the network.

- Consumer protection and arbitration

- Penalty action for non-delivery or demands made for provision of spinning reserve capacity at the outset.

For countries with on-going reform activities a more autonomous structure is planned. In the interim however the Board is usually given the remit of regulatory oversight of the sector. In an attempt at addressing all the needs of reform and provide technical, financial, monitoring and administrative direction a rather complicated institutional structure was created in Cote d'Ivoire [N'Guessan, Etienne, 2000]. The several bodies and groups have many areas of overlap of mandates and with the licensing of IPP there is more confusion in determining which body should be approached for a given problem. A move to streamline these institutions for more efficient administration of the sector was taken in 1998 with the creation of three state entities. These have replaced the state-owned body L'Energie Electrique de Cote d'Ivoire (ECCI) and the Fonds National de l'Energie Electrique(FNEE) with clearly defined mandates aimed at achieving the vision of the Government of the Cote d'Ivoire in the power sector:

SOGEPE – Societe de Gestion de Patrimonie du secteur de l'Electricite ;
SOPIE – Societe d'Operation Ivorienne d'Electricite and
ANARE – Autorite Nationale de Regulation de Secteur de l'Electricite.

The other bodies such as the Groupe Projet Energie(GPE), Groupe Special Programme Electrification Rurale(GSPER) and the Bureau National d'Etudes Techniques et Developpement(BNETD) continue to function as before in collaboration with the Compagnie Ivoirienne d'Electricite (CIE) responsible for the operation of the state owned generation plants as well as the transmission and distribution networks, and the IPPs.

The Ministry in charge of energy still holds overall responsibility for defining the direction and management of the sector, fixing of tariff, development of renewable energy and other issues related to energy production and utilisation. These bodies have been fully constituted and have effectively commenced operation since 2000 with visible signs of proper institutional management being realized already [N'Guessan, M'Gbra, 2002].

5.0 Routes towards reform

Karakezi and Mutiso [2000] have subdivided the reform process into structural (or functional) and Privatisation/Ownership or management changes. Reform can occur with no private sector support as in the case of South Africa where the funds, technical expertise and management structures exist.

Functional/structural reform relates to the processes involved in transforming a vertically integrated monopoly to gradations of unbundled or de-integrated entities with an ultimately fully unbundled sector having distinctly identified generation, transmission and distribution services. The areas of supply and consumer services such as billing, revenue/debt collection constitute further micro-unbundling.

Ownership/Management changes involves the transfer of ownership to a more corporate institution or the private sector. This process also follows a gradation of steps ultimately leading to complete private sector ownership as shown in Fig.3.

One important factor in the success and acceptance of the reform process is public education and debate through consultative conferences and use of the print and electronic media. Uganda's success story in its privatisation/liberalisation drive draws from regular consultation with consumers to ensure awareness and gain public support. Privatisation often results in increases in tariffs which of course affects the consumers. It is therefore important that the reasons for such steps are explained carefully and discussed if public sympathy is to be gained. At the other side of the spectrum, the reform process in Kenya is criticised by the public and has bred suspicion especially on the levy that is meant for rural electrification. Uganda's Electricity Board seems to embody many of the shortfalls that plague a number of African utilities and become the drivers of the reform process. The government's targets are laudable and focus on achieving economic viability of the sector with transparent and efficient financial practices and involvement of the private sector. Rural electrification is also highlighted using decentralised energy services.

However most of these are planned with the exception of the expansion of the installed capacity of the Owen Fall Hydro Project (OFHP) to a maximum of 200 MW. Of an estimated 2000MW potential of the Victoria Nile only 200 MW have been developed at the OFHP. Six other hydro sites have been identified of which four have been targeted by IPP's totalling 890 MW. As plans are discussed and made public, potential investors are expressing concern at the market size and expectations are that legislation will make provision for the exportation of power to neighbouring countries.

The case of Mauritius is rather unique in that the electricity sector started as small IPP's supplying targeted communities. As demand grew these IPP's formed the basis of the Central Electricity Board (CEB) which then became responsible for the generation, transmission and distribution of electricity nationwide. There is a significant contribution to the grid by sugar factories using bagasse, constituting up to 10.3% of the total electricity generation. Other sources are fuel-oil/diesel (approx. 60%), coal and kerosene. As structures emerge for sustainable and reliable supply of electricity, negotiations with the sugar factories were facilitated by the already existing institutional framework governing the sugar industry. There is a process of optimisation

of these suppliers for a more efficient and reliable operation. However the CEB remains the sole authority responsible for the transmission and distribution and is expected to continue barring any down-turn in its economic fortunes.

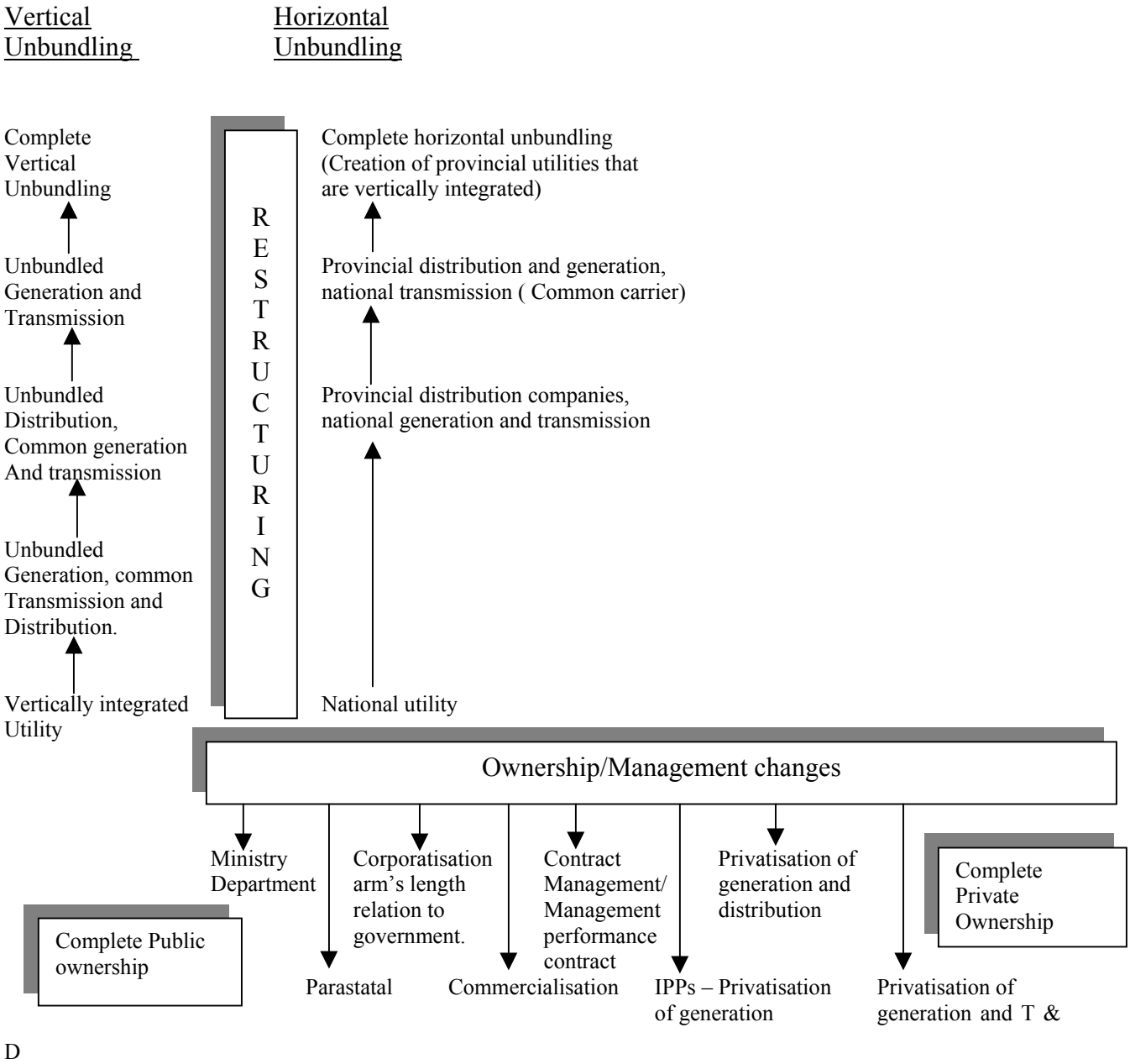


Fig.3 Structural/Functional and Ownership changes [Modified from Karakezi and Mutiso, 2000]

The South African case is interesting [Clarke, 2002]. While the vast majority of reforms have not yet been implemented, there exists great potential for these reforms to bring about positive change, not only in terms of improved system efficiencies and maximised returns to the South African state, but also in contributing measurably towards sustainable development in the country, and uplifted livelihoods for South Africa's poor. The power sector in South Africa is dominated by Eskom, South Africa's national vertically integrated electric monopoly. Eskom currently supplies 95% of the country's electricity requirements, which amounts to more than half of the electricity consumed on the African continent. Eskom also owns and operates the national

high voltage transmission grid, which connects the power stations and large urban and industrial areas, as well as neighbouring states. Electricity distribution is undertaken by Eskom, over 360 local municipalities, and 13 other distributors. Municipalities collectively directly service about 56 % of total customers (by number) and about 42 % of total customers by sales volume. Reforms will entail changes in industry ownership and structure throughout the South African electric industry, and should therefore affect players in all corners of the country. The route undertaken is one of regional unbundling through the formation of Regional Electricity Distributors (REDs). One of the key reasons why the Electricity Distribution Industry (EDI) will be rationalised is so that Government's electrification programme can be implemented and the Electricity Supply Industry (ESI) will be restructured to create opportunity for greater system, end-use and economic efficiencies, improved financial performance, and (hopefully) therefore, lower electricity prices for poor people

Ghana's power sector is vertically integrated with the supply responsibility fulfilled by the Volta Region Authority (VRA) which sells bulk electricity to the Electricity Corporation of Ghana (ECG) for distribution and sale. As part of the reform process license was granted to VRA to distribute power which resulted in the establishment of a regional entity, the Northern Electricity Department (NED), to implement the northern distribution zone component of the National Electrification Project.[1]

Ghana's attempts at reform were engendered by two severe droughts in a spate of ten years (first in 1982-83, and again in 1993). The Government of Ghana (GOG) and the VRA were made to realize that the country's near exclusive dependence (about 95%) on hydroelectric power was flawed and that hydroelectric power could not be solely relied upon to meet the electric energy requirements of the country. The droughts severely curtailed power supply at a time when domestic consumption of electricity was growing steadily and substantially spurred on by positive economic growth and the requirement of the National Electrification Scheme (NES). Between 1985 and 1993, domestic demand for electric power rose at a substantial rate of 10.8% per annum, increasing by 15% between 1993 and 1995 (MME, 1996). With demand gradually catching-up and eventually outstripping supply, there was the need for the generation capacity to be increased to reliably meet ever-soaring domestic load, contractual obligations to the Volta Aluminium Company, VALCO and the export market. Additional generation capacity was also needed to cater for the projected growth in demand.

Thus the reform of the power sector in Ghana was embarked upon in fulfilment of a conditionality attached to an IDA credit granted for the construction of the 330 MW thermal plant.

The unbundling of VRA is, in principle, underway. In spite of VRA's opposition and reluctance, it has registered the Takoradi Power Company Ltd. (TAPCO) to handle thermal generation assets at the Takoradi Thermal Power Complex. VRA has also registered the National Grid Company Ltd. (GRIDCO) as a wholly owned subsidiary that will take over the transmission and loads dispatch assets and also operate as the Electricity Transmission Utility (ETU). ETU will be an 'open access', 'non-discriminatory' facility.[2] On the other hand, wholesale competition is limited as only distribution concessions and large consumers have access rights to transmission services.

[1] In 1989, the Government of Ghana launched an ambitious programme, the National Electrification Scheme, to extend the national electricity grid to every part of the country over a 30-year period. The National Electrification Project covered sub-projects to implement Phase 1 and 2 of the NES.

[2] This implies that all generators and distributors will have access to its use based on agreements reached with the Grid Company.

The VRA had intended to transfer the NED into another subsidiary, a proposed Northern Electricity Distribution Company Ltd. (NEDCO). This was however refused by the GOG because of its plan to consolidate NED and ECG into a single company with strategic business units to manage the five proposed distribution areas. The distribution network has been demarcated into five distribution concessions areas but concessions are yet be allocated [Edjekumhene, I., 2000].

Kenya followed a route of vertical unbundling of its electricity sector with the Kenya Electricity Generating Company (KENGEN), a government owned company responsible for power generation and the Kenya Power and Lighting Company (KPLC) solely responsible for transmission and distribution of electricity with joint private-public sector ownership. Options for geothermal power generation are being actively considered with an estimated capacity of 576 MW by the year 2017. 1997 operations of the three 15 MW units run by the Ol-karia East Power station operated by KENGEN, indicate an availability and load factor of 96.8% and 92.8% respectively. Two other geothermal plants are expected to be commissioned in 2002 and 2003 with 60 MW capacities each.[Bw'Obuya, 2001]

Uganda followed the route of transforming its utility to a more viable and attractive business entity, which essentially addressed the separate activities of generation, transmission and distribution, prior to the unbundling of its operations. By the end of 1999 it had seen remarkable improvement in a number of performance indicators such as increased revenue collection (from 83% to 94% in 1998), increased billing for consumption of about 12%, better debt collection rate, and a more attractive business profile[Bidasala-Igaga, 2001]. The Legal and regulatory framework in operation is not attractive for investors as the UEB is considered as both an operator and regulator.

The Zimbabwean electricity sector has an installed capacity of 1961 MW with an additional 68 MW generated seasonally by privately-owned sugar plantation companies for self use. A 750 kW mini-hydro plant is run by a private company, Rusitu Power Corporation which sells power to Zimbabwe Electricity Supply Authority (ZESA). Over 50% of Zimbabwe's power is imported from the Southern African Power Pool (SAPP). The utility had experienced poor performance as a result of unfavourable macroeconomic conditions in the country followed by a drought and political unrest in the early 1990's. This backdrop forced the government to initiate a series of reform measures aimed at becoming more self-sufficient in the power industry [Dube, 2000], . The structures instituted then did not follow best business practices to attract investors and a number of the reform targets were un-met. For example, although attempts were targeted at making the utility more efficient, Zimbabwe's legal and regulatory machinery does not attract private investment due to its regulation concerning pricing, staffing, and capital budgets.

Another cycle of reform started in 1998 and has seen more impressive performance rating as given in Table 6 [Mangwengwende, 2000]. The formation of a subsidiary of ZESA, the Zimbabwe Power Company (ZPC) which will compete with IPPs, signals a more liberalised approach to the reform process. It is hoped that with a more investor–friendly regulatory and legal framework more investment will be realised in the sector which will translate to an increase of the 39% access to electricity figures currently quoted. [Muguti, 2001].

Table 6. Some performance indicators showing pre-and reform profiles

Activity	**19912/93**	**2000**	**% change**

Electricity sales(GWh)	7,731	11,000	+42%
Net Income(% Sales)	9%	15%	+67%
Customer connections per year	6,000	25,000	+316%
Interconnection capacity(MW)	700	1,700	+142%

Source : Modified from Mangwengwende, 2001

Cote d'Ivoire's power sector was initially state-owned. During the period 1990 – 1997, the sector has been significantly transformed to an almost fully private owned utility operations. Current statistics indicate a total generating capacity of 1100 MW with 270 MW state-owned thermal plants, 210 MW thermal plants owned by IPPs and hydroelectric generation of 420 MW. The activities of the two IPPs, CIPREL (Compagnie Ivorienne de Production d'Electricite) and AZITO Energie have further imcreased the total electricity capacity with the discovery of natural gas

The reform of the power sector in Cote d'Ivoire was a bold step towards private sector participation in the form of a complete management contract awarded by the EECI (Energie Electirique de Cote d'Ivoire) to the Compagnie Ivorienne d'Electricite (CIE). Certain relief facilities were granted to this company in facilitating the development of the sector, such as freedom from major repairs and maintenance and new investment in the grid [N'Guessan, E 2000] In this case the legal and regulatory machinery existing prior to reform was favourable to the privatisation process by legal provision within its mandate. It was however strengthened to reflect the new aspects of competition and further private sector participation as part of the reform process especially in the areas of self-financing of the sector and resource mobilisation for improving investment activities in the sector. Cote d'Ivoire also exports electricity to Ghana and there are plans for export to Mali and Burkina Faso.

6.0 Emerging structural changes

Institutional and conceptual changes are gradually emerging as a consequence of the reform process, and the debate consequent on the process, among researchers and practitioners alike, namely :

- Consideration of cross border importation and exportation of electricity and the emergence of power pools across the continent (SAPP, WAPP and EAPP)
- Unbundling of state-owned vertically integrated utilities for eventual divestiture to the private sector.
- Introduction of IPPs as major suppliers of electricity.
- Introduction of legislation to accommodate private sector involvement in the unbundled sector.
- Considering electricity provision and its accompanying services as a vehicle for poverty alleviation.
- Relinquishing state control as a regulator and licensing body to an autonomous regulator.
- Consideration of innovative ways of revenue collection such as prepayment meters, and initial deposit before connection.
- Encouraging micro-credit and other financial intermediaries in rural areas to increase income generating activities which could eventually lead to increasing load and thereby justify electricity service provision.

7.0 Criticism of the reform pathway

The time frame given by funding partners for the reform process is often criticised by researchers as too short especially when compared with the protracted period enjoyed by developed economies in a similar exercise. As governments come to terms with the restructuring that this process demands the pressure imposed by donors adds another dimension to the difficulty in meeting targets. There is a school of thought that questions the justification of funding partners to apply such pressures on developing countries to privatise as a means of accessing funding for sector reform, when most of the utilities in the developed world are largely state-owned. It is argued that the state through management institutions (for example management performance contracts) monitored by the funding agencies could make a turn-around in the fortunes of the sector with no involvement of the private sector. They claim that the vertically integrated utilities were the creation of colonial governments deemed as the best means of ensuring security of supply. The question raised is whether this action could be a means of securing markets for their utilities in developing countries.

The other school of thought is more pragmatic and realistic. It argues that to halt the spiralling deterioration of poorly managed and financially beleaguered utilities where no indications exist of corporate or best business/industrial practice and to avoid a situation that could engender economic collapse and social collapse, one has to recognize these deficiencies and find sustainable and irreversible solutions. In many developing countries several cycles of donor funding have been obtained for sector improvement with eventual reversals in the gains made, largely due to poor management, political interference, corruption and heavy debt burdens, coupled with competing demands from the health, education, transport and defence sectors. Furthermore the level of funding required to salvage these utilities is usually beyond the reach of the public sector. With the track record of some these utilities donor confidence has waned. It therefore makes sense that if funding is to be provided externally, assurance of proper fiscal discipline and management must be a pre-requisite for support. With the culture inherent in the private sector to practice prudent and best practice as a profit making venture, this seems the best choice under the prevailing circumstances that will restore donor confidence that the targeted activities will be implemented and provide a turn-around in the utility's performance.

8.0 Reforms versus diversification in the power sector

The continent has a rich diversity of fuel being used and a potential for inclusion in the fuel-mix pattern of many electricity supply utilities.(See Table 1.0)

Table 4. Summary of fossil fuel reserves in Africa

Sub-region	**Crude oil (1,000 barrels)**	**Natural Gas (Bcf)**	**Coal(MST)**
Central Africa	4,603,913	9,635	101
East Africa	262,528	7,060	220
North Africa	42,509,526	211,000	74
Southern Africa	5,441,362	7,470	67,013
West Africa	22,524,720	125,933	287
Total Africa	**75,442,049**	**361,098**	**67,695**

Legend : Bcf – billion cubic feet
MST - million short tons
Source :DOE, Energy Information Administration, USA, 2000

Table 4 provides some indication of the fossil fuel reserve available in Africa. The GHG emission debate and the Kyoto protocol is relevant for the continent and cleaner technologies must be transferred to developing countries to enable them exploit these resources in an environmentally friendly fashion. North and West Africa have 86.2 % of the continent's total crude oil reserve and 93.3 % of the total natural gas reserve, whereas 99 % of the coal reserve is found in Southern Africa. The increasing availability of advanced technologies in natural gas-fired combined cycle power generating plants (gradually replacing steam turbines) provide opportunities for cleaner applications for those countries with such fuel reserves. The role of natural gas and coal is significant in the Southern African region and South Africa alone has over 90% of the region's reserve capacity (55,000 million tons). Coal contributes 40% of the power generated in South Africa, 80% in Botswana and over 58% in Zimbabwe. [Maya, 2000]. Its use in the production of synthetic fuels for a variety of energy use will be quite attractive as the technologies improve thereby enabling industries to comply with laws on emission and environmental pollution. Their use in the short term will however depend on whether the costs involved are affordable by economies of developing countries.
With these developments, it is evident that such resource base cannot be easily discounted in the energy-fuel mix.

Although there are niche markets for the efficient and economic utilisation of renewable energy technologies such small incremental contribution to the energy use profile does not impact with any significance on the national figures and at best not more than 3%..

In many of the cases cited in the literature, reform in the sector quite often concentrates on increasing the efficiency of the grid supply and raising its reliability and quality of supply. Access is considered albeit more in terms of extending the grid than using alternatives or renewables. However some countries do consider these RET option as in the South Africa, Cote d'Ivoire and Ghana. This may not be directly linked with the reform portfolio, although it does contribute to the overall creation of greater access especially in areas that could not be connected economically through grid extension. The matter of a differentiated tariff structure applied to grid connected and off-grid renewables must be carefully addressed in order to provide a more equitable reflection of energy pricing which takes account of externalities in the grid connected fossil fuel based plants as opposed to the cleaner ('green')technologies used for some renewables.

9.0 **Intra-African electricity supply integration initiatives**

As regional power utilities recognize their inability to provide adequate and reliable electricity to consumers especially in rural areas against other competing demands on national budgets, regional power integration initiatives are becoming a means of addressing these shortfalls. There are initiatives operating in each of the sub-regions interconnecting grids for a more optimum supply of electricity and better penetration and access.

In the Southern African sub-region, the South African Power Pool (SAPP) was created in 1995 following the signing of a Memorandum of Understanding by twelve (12) countries in the Southern African Development Community (SADC). The utilities participating in the SAPP initiative are given in Table 7. The coordination centre is located in Harare, Zimbabwe[Department of Energy, USA, 2000 (website)]

The East African Pool is the Eastern African initiative and plans to interconnect the grids of Kenya, Uganda and Tanzania. Already, Kenya imports electricity from Uganda's 180 MW Owen falls hydroelectric facility.

The West African Power Pool plans to interconnect the utilities of Cote d'Ivoire, Nigeria, Benin and Togo and Mali. A World Bank credit of US$39m was provided for the installation of a 200 MW capacity hydroelectric facility at the Manantali dam located on the Bafing river in Mali with transmission lines to provide supply to Mali, Mauritania and Senegal [DOE, website, 2001]. This will be part of the backbone network for the WAPP.

Table 7. The Southern African Power Pool

Country	Utility
Angola*	Empresa Nacional de Electricidade (ENE)
Botswana	Botswana power Corporation (BPC)
Democratic Republic of Congo	Societe National d'Electricite (SNEL)
Lesotho	Lesotho Electricity Corporation (LEC)
Malawi*	Electricity Supply Commission (ESCOM)
Mozambique	Electricidade de Mozambique (EDM)
Namibia	Nampower
South Africa	Eskom
Swaziland	Swaziland Electricity Board (SEB)
Tanzania*	Tnazania Electric Supply Company (TANESCO)
Zambia	Zambia Electricity Supply Company (ZESCO)
Zimbabwe	Zimbabwe Electricity Supply Authority (ZESA)

* *Member states not yet connected to SAPP*

10.0 Some policy recommendations

- Careful study of the market and financial structures that make economic sense as well as workable legal and regulatory mechanism for sustainable reform in the sector.
- Encouraging community participation in reform exercises in order to promote ownership and hence interest in the sustainability of the process.
- A participatory and inclusive policy formulation approach should be adopted in the provision of energy services. This would include different economic groups, such as business houses, industries and even low income earners, through representative bodies.
- Sector reform should target increasing access as well as efficiency.
- Competitive private sector participation in cases where the reform process cannot be funded by government, can improve access and affordability given an effective legal and regulatory machinery.
- Evidence has shown that there exists a mixture of energy sources per activity that engenders flexibility of choices especially in rural settings and among the urban poor. More efficient use of this strategy should be followed and a gradual transition to more environmentally friendly fuels adopted. Invariably households make use of a range of energy sources depending on their availability and efficiency and cost effectiveness of application for different tasks.
- The urban poor are more likely to benefit from electricity reforms in terms of affordability and access, as a minimum of infrastructural investment will be needed, considering that

the Low and Medium tension lines may already be routed through these areas. Their rural counterparts, because of primarily the costs involved in extending the networks to the rural areas in the light of the low load factor in these communities may not be so fortunate, especially if supporting financial structures are not effected. In this regard, alternative energy sources will be necessary to meet the needs of the rural communities in an affordable manner, especially those communities far removed from the transmission lines of the network [ESMAP Energy Development Report 2000]. Alternatively small industrial and other activities, e.g. micro credit schemes should be introduced with relaxed pay-back periods to increase load and thereby raise the economic justification for grid connection or other decentralised energy service provision.

- Rural communities referred to as remote can no longer continue to be marginalised and deprived of the basic social amenities taken for granted by their urban counterparts. They also have a right to education, health-care and a better standard of life. It must be noted that they provide the bulk of the nation's wealth, though sadly the returns obtained are highly disproportional to their contribution to the nation's kitty and too meagre to have a substantial impact on their lives. Such imbalances must be addressed by policy makers and urgent provisions must be made for the improvement of the living conditions of these communities, constituting almost 74 % of the nation's population. This calls for new thinking and strategies and most importantly, financial and political commitment to the realisation of the programmes aimed at providing greater access to electricity nation-wide which is one of the steps towards poverty alleviation and increased equity for growth.
- The DES system provides a means of decentralised electricity distribution which enhances the reliability of electricity distribution and access. This system can be the way forward in realising the provision of greater access to electricity and other energy related activities in the rural communities[Redwood-Sawyerr and Silla, 1999].
- Public education on the reasons for power sector reform and its impact on development issues is critical to it acceptance by the consumers
- Proper study of the sector should precede any reform activities to ascertain the best route within the context of the existing operations of the sector (e.g. transaction costs, human resource implications) and success stories of reform in countries with similar economies should be referred to.
- Effective customer education on DSM, and increased plant efficiency can improve the power available for distribution and supply.
- Funding from the traditional multi-national institutions are not readily available to support reforms and when identified are accessible under often unfavourable conditionalities.
- Institutional structures for the proper implementation.. monitoring and evaluation of the reform process are instrumental to the success of the whole exercise.

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Appendix A. Electric Generating Capacity, 1997

Country	Capacity (GW)	Type (%)				Country	Capacity (GW)	Type (%)			
		Thermal	Hydro	Nuclear	Other			Thermal	Hydro	Nuclear	Other
Cameroon	0.63	15.5	84.5	0	0	Angola	0.62	33.2	66.8	0	0
Central African Rep.	0.04	48.8	51.2	0	0	Botswana	0.22	100.0	0	0	0
Chad	0.03	100.0	0	0	0	Comoros	0.01	80.0	20.0	0	0
Congo	0.12	24.6	75.4	0	0	Lesotho	0.00	0	0	0	0
Dem. Rep. Of Congo	3.19	1.8	98.2	0	0	Madagascar	0.22	51.8	48.2	0	0
Equatorial Guinea	0.01	80.0	20.0	0	0	Malawi	0.19	21.1	78.9	0	0
Gabon	0.31	46.5	53.5	0	0	Mauritius	0.36	83.8	16.2	0	0
Sao Tome & Principe	0.01	66.7	33.3	0	0	Mozambique	2.38	12.8	87.2	0	0
SUBTOTAL-C. Africa	**4.34**	**8.9**	**91.1**	**0**	**0**	Namibia	0.00	0	0	0	0
Burundi	0.04	25.6	74.4	0	0	South Africa	35.18	93.0	1.7	5.2	0
Djibouti	0.09	100.0	0	0	0	Swaziland	0.14	61.3	38.7	0	0
Eritrea	0.00	0	0	0	0	Zambia	2.44	7.8	92.2	0	0
Ethiopia	0.49	16.0	77.8	0	6.2	Zimbabwe	2.07	67.8	32.2	0	0
Kenya	0.81	19.8	74.7	0	5.6	**SUBTOTAL-S. Africa**	**43.83**	**81.2**	**14.6**	**4.2**	**0**
Rwanda	0.03	11.8	88.2	0	0	Benin	0.02	100.0	0	0	0
Seychelles	0.03	100.0	0	0	0	Burkina Faso	0.08	61.5	38.5		0
Somalia	0.07	100.0	0	0	0	Cape Verde	0.01	100.0	0	0	0
Sudan	0.50	55.0	45.0	0	0	Cote d'Ivoire	1.17	23.7	76.3	0	0
Tanzania	0.54	39.4	60.06	0	0	Gambia	0.03	100.0	0	0	0
Uganda	0.16	4.3	95.7	0	0	Ghana	1.19	9.7	90.3	0	0
SUBTOTAL-E. Africa	2.76	33.8	63.5	0	2.7	Guinea	0.19	76.9	23.1	0	0
Algeria	6.04	95.4	4.6	0	0	Guinea-Bissau	0.01	100.0	0	0	0
Egypt	16.62	83.7	16.3	0	0	Liberia	0.33	75.6	24.4	0	0

Libya	4.60	100.0	0	0	0	Mali	0.11	100.0	43.9	0	0
Morocco	3.96	74.6	25.4	0	0	Mauritania	0.11	75.6	58.1	0	0
Tunisia	1.72	96.3	3.7	0	0	Niger	0.06	56.1	0	0	0
Western Sahara	0.06	100.0	0	0	0	Nigeria	5.88	41.9	39.8	0	0
SUBTOTAL-N. Africa	**32.88**	**87.7**	**12.3**	**0**	**0**	Senegal	0.24	100.0	0	0	0
Source: US. Energy Information Administration. GW = Gigawatts (billion watts)						Sierra Leone	0.13	98.4	1.6	0	0
						Togo	0.03	88.2	11.8	0	0
						SUBTOTAL-W.Africa	**9.61**	**52.2**	**47.8**	**0**	**0**
						Total Africa	**93.5**	**75.8**	**22.2**	**2.0**	**0.1**

Some thoughts on regional meetings – Jonas

1. Obtaining recent country performance indicators of utilities and the progress of the reform process requires regional meetings/workshops that will culminate form writing contracts (case studies) given to experts in the targeted countries, with perhaps a co-ordinating author per sub-region or continent.
2. A profile of details required is essential especially viewed in the context of the overall results required in gauging the reform process. The tables below attempts to capture some of the data required, albeit technical in some cases.
3. In the absence of these guidelines papers will address theoretical issues and generalities. With paid contracts, authors could sub-contract technical data provision to engineers/researchers in the utilities.
4. Information has to be paid for in some cases and will be withheld if no proper incentive is provided.
5. A programme of workshops could be panned leading to a major meeting of co-ordinating authors and other experts constituting an editorial committee to compile the overall status of the reform globally. For wider appraisal, a review group could be instituted to ensure clarity, coherence, etc.
6. This is a process being followed now by an ENDA/EDRC directed book writing on Energy for sustainable development in Africa to be presented at the WSSD in August 2002.