African Energy Policy Research Network (AFREPREN)

Making the African Power Sector Sustainable

Final Regional Report

Compiled

By

AFREPREN/FWD

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Abbreviations and Acronyms

AFREPREN/FWD	African Energy Policy Research Network/Foundation for Woodstove Dissemination
CCK	Communication Commission of Kenya
CAPCO	Central African Power Corporation
DANIDA	Danish International Development Cooperation Agency
DFID	Department of International Development
DGE	Department of General Energy
EAIF	Emerging Africa Infrastructure Fund
ECG	Electricity Company of Ghana
EDM	Energie Du Mali
EEC	Eritrea Electric Corporation
EIA	Environment Impact Assessment
EIA	Environmental Investigating Agency
EIB	European Investment Bank
EIS	Environmental Impact Statement
ERA	Electricity Regulatory Authority
ERB	Electricity Regulatory Board
ESC	Electricity Supply Commission
ESKOM	Electricity Supply Commission of South Africa
ESMAP	Energy Sector Management Assistance Programme
FINNIDA	Finnish International Development Cooperation Agency
FMO	The Netherlands Development Finance Company
GDP	Gross Development Product
GEF	Global Environment Facility
GNESD	Global Network on Energy for Sustainable Development
GNP	Gross National Product
GWh	Gigawatt Hours
HGNP	Hale's Gate National Park
ICT	Information and Communication Technology
IEA	International Energy Agency
IPD	Independent Power Distributor
IPP	Independent Power Producer
IPTL	Independent Power Tanzania Limited
KenGen	Kenya Electricity Generating Company Limited

KPC	Kenya Power Company
KPLC	Kenya Power and Lighting Company
KPLC	Kenya Power and Lighting Company
KVDA	Kerio Valley Development Authority
kWh	Kilo-Watt-Hour
LRMC	Long Run Marginal Cost
MCE	Ministry of Mines, Quarries and Energy
MEM	Ministry of Energy and Minerals
MEM	Ministry of Energy and Mines
MINEF	Ministry of Environment and Forestry
MRLGH	Ministry of Regional Local Government and Housing
MW	Megawatt
NED	Northern Electrification Department
NEP	National Electrification Project
NER	National Electricity Regulator
NRECA	National Rural Electric Cooperative Association
OECD	Organization for Economic Cooperation and Development
PPA	Power Purchase Agreements
PPA	Power Purchase Agreements
PV	Photovoltaic
REA	Rural Electrification Agency
RED	Regional Distribution Companies
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SHEP	Self Help Electrification Project
SHS	Solar Home Systems
STAMICO	State Mining Corporation
SWER	Single Wire Earth Return
TANESCO	Tanzania Electric Supply Company
TARDA	Tana and Athi River Development Authority
TPDC	Tanzania Petroleum Development Corporation
TRDC	Tana River Development Company
UEB	Uganda Electricity Board
UEDCL	Uganda Electricity Distribution Company Limited
UNECA	United Nations Economic Commission for Africa

UNEP	United Nations Environment Programme
USc	US Cents
USD	US Dollars
UShs	Uganda Shillings
VRA	Volta River Authority
WRI	World Resources Institute
ZESA	Zimbabwe Electricity Supply Authority
ZESA	Zimbabwe Electricity Supply Authority
ZPA	Zambia Privatization Agency

Executive Summary

The biggest challenge facing sub-Saharan African countries today is to reach a sustainable rate of positive economic growth that will enable them to cope with soaring demographic and urban growth. In a bid to stimulate a genuine dynamic of development and to rise above the economic, social, political, and environmental crises that have beset the region more or less permanently since the late 1970s, the countries of the region together with the support of multilateral institutions introduced several sectoral reforms. Among these reforms are those related to the power sub-sector which were, as analyzed by energy experts, aimed at improving financial and technical efficiency of utilities, facilitating divestiture and guaranteeing future electricity supply in an open globalised energy market.

Electricity is needed both to industrialize and provide basic energy for the majority of the people living off the grid in rural areas. This situation needs major changes not only because of development demand but also for the region and its sub-regions is to be economically competitive with other developing regions of the world and is to realize its sustainable development goals – the subject of this study.

Traditionally, state owned power utilities in Africa have enjoyed a monopolistic hold over their national electricity industry. There is a growing consensus that the monopoly has contributed to the undeniable under-performance in the delivery of electricity services, particularly to the majority low income groups. Power sector institutions as discussed in this report, are mainly characterised by unreliability of power supply, low capacity utilisation and availability factor, deficient maintenance, poor procurement of spare parts, and, high transmission and distribution losses among other problems. Consequently, the performance of the power sector was perceived as unsustainable which, in part, led to the advent of reforms in the African power sector.

The broad objectives of this study is to assess the sustainability of power sector in Africa by examining the socio-economic and environmental impacts of power sector reforms and use the results of the assessment to determine the extent to which reforms have made the power sector in the region sustainable. In particular, the study assesses the implementation of the process of power sector reforms in fourteen sub-Saharan Africa countries (Kenya, Zimbabwe, Senegal, Tanzania, Ghana, Burkina Faso, Zambia, Eritrea, Namibia, Cameroon, Cote d'Ivoire, Mali, Niger and Uganda). It then proposes options that could enhance the sustainability of the power sector.

In addressing the aforementioned broad objectives, the study focused on four specific objectives which include; the assessment of socio-economic and environmental impacts of past and current initiatives in the power sector; assessing the gaps in the legal and institutional framework of past power sector reform initiatives; demonstrate how to integrate environmental and socio-economic issues in power sector reforms and raise awareness among policy-makers on strategies to improve the sustainability of the power sector in Africa. The study involved examining power sector reforms in 14 African countries namely Kenya, Zimbabwe, Senegal, Tanzania, Ghana, Burkina Faso, Zambia, Eritrea, Namibia, Cameroon, Cote d'Ivoire, Mali, Niger and Uganda.

Based on the discussion and analysis presented in this report, several findings emerge. One of the key findings is that power reforms were not explicitly designed to ensure sustainability of the power sector. Reforms were primarily designed to bridge short term generation shortfalls and enhance the financial health of state-owned power utilities.

This study regarded socio-economic impacts of reforms (especially electrification of the poor) as an important indicator of the power sector's sustainability. In overall terms, socio-economic impacts of reforms on the poor appear to be negative or neutral. This is because, first and foremost, electrification of the poor was not significantly addressed in the reform process and was, in several cases, almost an afterthought with the exception of Cote d'Ivoire, Cameroon, Malawi, Burkina Faso, Senegal, Zimbabwe, South Africa and Mauritius.

Secondly, while reforms have led to the establishment of rural electrification funds and boards, these developments have not helped to increase electrification levels. In part, this is because the rural electrification funds and boards have not provided effective and innovative mechanisms that would ensure they achieved their objectives. Their design appears to have largely replicated that of past (and failed) mechanisms. Consequently, the rural electrification funds and boards have very little to show in terms of electrification of the poor.

Another important finding with regard to the impact of socio-economic impact of reforms on the poor is the increase in the cost of electricity and the associated reduction or removal of subsidies for the poor. Tariff increases were motivated by the desire to improve the financial health of the state-owned utilities as well as to attract private investors. While these are desirable attributes as far as the sustainability of the power sector is concerned, however, placing a heavy financial burden on the poor to the extent of leading to disconnections (eg. in Ghana) is neither desirable nor does it contribute to a sustainable power sector.

Another key finding is that, in many countries in the region, power sector reform appear to have marginalized local private investment in the power sector. Current trends seem to indicate that, in the medium term, the state is effectively handing over the entire electricity industry to non-national operators. In the long-term, this may be an unsustainable arrangement.

With regard to the financial sustainability of the electricity utilities, reforms appear to have largely met the objective of turning electricity utilities into profitable entities. This is important as it ensures that the resources that previously went into salvaging the utilities are utilized to meet other social and economic needs such as health, education and infrastructure. Furthermore, reforms have also provided for a more sustainable financing mechanism for rural electrification through the introduction of a levy mainly imposed on urban electricity consumers.

The environmental impacts of power sector reforms and the extent to which they have contributed to the sustainability of the power sector are discussed below. One of the key findings is that the amendments of the Electricity Acts have partially contributed to the sustainability of the power sector by ensuring that Environmental Impact Assessments are carried out prior to major electricity generation, transmission and distribution installations. However, the amended Acts are silent on environmentally unfriendly installations that were established prior to the new Electricity Acts.

A key finding highlighted in this study is the worrisome trend in many countries, except for Zimbabwe, Kenya and Mauritius, whereby the share of IPPs generating electricity from sustainable energy sources such as hydro, solar, wind, geothermal[1] and bagasse-based cogeneration[2], is declining[3]. If this trend continues unabated, it will not only imply an increase in the level of greenhouse gases emissions from the energy sector in sub-Saharan Africa, it may also lead to an increase in the cost of electricity thus affecting the poor negatively as discussed earlier.

Another key finding is that major concern has been raised over the development of large-scale hydropower plants, especially the proposed Bujagali Dam in Uganda and the Inga Megadam in the Democratic Republic of Congo. Environmental lobby groups in the region have put up a substantial amount of resistance citing potential environmental destruction associated with the proposed dams. However, it is important to note that the debate over large scale hydropower dams has evolved with many analysts arguing that the issue is not between having large hydropower dams or not but

[1] The most promising geothermal resources are concentrated along the Rift Valley in the eastern African region and may therefore not be applicable to countries in other regions of Africa.

[2] Which is renewable if the feedstock is based on a renewable fuel such as biomass - it can also be considered to be an efficiency measure.

[3] Where favourable wind regime exists, IPPs can also invest in wind farms like in Morocco and Egypt. Small hydro-based IPPs may not be difficult to finance because of they have lower risks than large hydro which has high risks associated with long lead time for project implementation.

between poorly designed dams and well designed hydropower dams that take into account of key socio-economic and environmental concerns as outlined in the World Commission on Dams and Development.

Being in charge of regulating the newly reformed power sectors in the respective countries, the performance of the Electricity Regulatory Agencies was assessed. Preliminary findings of this assessment indicate that the regulatory agencies have done little to ensure the sector's sustainability. In part this is attributed to the weakness of the regulatory agencies to enforce the Electricity Act as a result of two key factors: Firstly, the electricity regulatory agencies are relatively new entities and have, therefore, not built significant capacity. Secondly, in some instances, even where capacity exists, the ability of the regulatory agency to perform its duties has been compromised by its lack of the requisite independence as a result of politically motivated appointments of the members of the respective agencies' boards.

Furthermore, the regulatory agencies have done little to promote an environmentally-sustainable power sector by reviewing electricity generation options. For example, there is no indication of regulatory agencies setting specific targets for the share of electricity generated from renewables energy technologies. In addition, with the exception of Mauritius, the regulatory framework in most of sub-Saharan African countries does not provide for attractive tariffs to sustainable energy generation options such as small-hydro, wind, bagasse-based cogeneration and geothermal.

Based on the assessments of the socio-economic and environmental impacts of power sector reforms, this study concludes that the reforms process does not provide for the adequate policy, institutional, legal and regulatory frameworks required to ensure the sustainability of power sector. To ensure the sector's sustainability, reforms have to be redesigned to increase access to electricity among the majority poor of the region as well as increase the share of renewables in the power supply mix while encouraging more efficient use of electricity.

Having examined the extent to which reforms have contributed to the sustainability of the power sector, this study has compiled a number of recommendations. With respect to enhancing access to electricity among the poor, this study recommends:

Sequencing reforms: Sub-Saharan African countries whose reforms are not at advanced stages should ensure that they establish structures and mechanisms for increased rural electrification before (or parallel to) embarking on large-scale privatization reforms.

Linking electrification targets to contract renewals REAs Board Members: The newly formed rural electrification agencies should have specific targets for electrifying the poor. This should be enforced through making the targets as part of the agencies' annual reporting as well as renewal of the contracts of the board members as well as the executive employees of the agencies.

Linking electrification targets to licenses renewals and tariff increments: The electricity regulatory agencies could also enforce the electrification of the poor through linking set targets to issuance of licenses and concessions to electricity distribution utilities. In addition, to ensure that the poor's access to electricity is sustainable, the regulatory agencies should ensure that tariff increments do not adversely affect the poor by providing for subsidies as well as encouraging utilities to utilize low cost electrification options.

To ensure increased access to the poor at an affordable cost, the study recommends the use of the following low-cost electrification options:

- Longer distances between distribution transformers
- Single pole transformer mounting
- Shorter, smaller and fewer poles
- Pre-fabricated wiring systems
- Load limiters
- Single Wire Earth Return (SWER)
- Reduced conductor sizes
- High-mast community floodlights
- Equipment standardization

Another possible option of minimizing the cost of electricity among the poor is by providing subsidies to cushion them from the impacts of the high tariff increases triggered by reforms.

With regard to ensuring the environmental sustainability of the power sector, the study recommends:

Review of Electricity Acts: Electricity Acts should be amended to ensure environmentally harmful electricity generation, transmission and distribution entities that were installed prior to EIAs becoming mandatory are assessed and mitigating measures carried out. The electricity regulatory agencies could enforce this requirement by linking it renewal of licenses and the review of tariffs.

Explicit targets for the share of renewables in the electricity generation mix: To mitigate the negative trend of having an excessively large share of IPPs generating electricity from fossil fuel-based power plants, it is proposed that the regulatory agencies in collaboration with the Ministries

of Energy should set explicit targets for the share of electricity generation from proven renewable energy technologies such as hydro, wind, solar PV, bagasse-based cogeneration and geothermal[4].

Modular development of electricity generation facilities: In order to minimize the potential negative environmental effects of large scale electricity generation installations, power development planners in the region should consider including small to medium scale but reliable power plant that are also environmentally friendly.

With regard to addressing gaps and barriers in the legal and regulatory framework, there are several options that could ensure the power sector's sustainability. Essentially, enforcing some of the options discussed earlier in this section could go along way in ensuring the sector's sustainability:

Strengthening the regulatory agencies: Probably the most effective measure in addressing the gaps in the legal and regulatory framework is ensuring the independence of the regulatory agencies. This can be achieved by enhancing the representation among the board members.

Mobilizing local capital investment: The examples of Zimbabwe and Mauritius demonstrate the potential financial and technical capability and viability of local private investors in the power sector. However, appropriate policy and financial incentives such as lowering entry requirements and tax holidays should be enacted to encourage local private investment in a privatised electricity industry.

Encouraging private participation and unbundling even in small power systems: Some proponents of power sector reforms have in the past argued that small power systems (i.e less than 500 MW) cannot be viably unbundled. However, there are lessons that can be learnt from a country such as Uganda. With an installed capacity of just above 300 MW, this country has not only fully unbundled its utility but also registered positive returns. In addition at all levels of the power sector, there is active private participation.

Issuing licenses and Power Purchase Agreements (PPAs) covering a longer period: Issuing longer term licenses and PPAs can ensure that the selling price of electricity by IPPs is moderated. This is essentially because, longer term agreements allow for sufficient time for the investor to pay off project financing debts as well as provides adequate amortization period for the equipment.

[4] As mentioned earlier, the most promising geothermal resources are concentrated along the Rift Valley in the eastern African region and may therefore not be applicable to countries in other regions of Africa.

Overcoming challenges of rural electrification: Perhaps the most common barrier of rural electrification identified is the high cost of grid extension. An immediate option to lower the cost of rural electrification is the use of proven low cost electrification options such as those identified in this study. Another option is the promotion of decentralized electricity generation in rural areas using hydro, wind, bagasse-based cogeneration and where applicable geothermal. This would greatly reduce the need for transmission lines to transverse long distances and sometimes difficult terrain. However, while these technical options are attractive, the policy framework has to provide adequate incentives to realize the benefits of these options.

Leveling the 'playing field': As mentioned earlier, electricity regulatory agencies could play a significant role in promoting proven environmentally friendly electricity generation options such as hydro, wind solar PV, bagasse-based cogeneration and geothermal. The regulatory agencies could promote these technologies through setting of specific targets as well as providing for preferential tariffs for their electricity sales. In addition, regulatory agencies could provide attractive incentives to investors willing to install electricity generation plants based on these energy sources.

This regional report is organized into 7 chapters. Chapter 1 provides the background on the study. Chapter 2 provides an overview and the status of the power sector. Chapter 3 provides the status of power sector reforms and regulatory measures. Chapter 4 provides an assessment of the socio-economic impacts of power sector reforms. Chapter 5 assesses environmental impacts of power sector reforms. Chapter 6 brings together the key findings of the study and, finally, Chapter 7 recommend possible policy options that could enhance the sustainability of the power sector.

Chapter 1: Introduction

1.1 Review of Past Work Done on Reforms

There is a large body of literature mainly comprising of status reports on power sector reforms undertaken by ESMAP, World Bank, Global Environment Facility (GEF), Department for International Development (DFID), Swedish International Development Co-operation Agency (Sida), Finnish International Development Co-operation Agency (FINNIDA), Danish International Development Co-operation Agency (DANIDA) and Energy and Development Research Centre (Sida, 1998; MFAF, 2004; DANIDA, 1991; Kjellstrom, 1994; Kjellstrom, et al, 1992; Gerger and Gullberg, 1997; Gullberg, et al, 1999). However, most of the studies undertaken by these institutions mainly cover reforms in Asia, Latin America or South Africa (Sanghvi and Barnes, 2001; Davidson and Mwakasonda, 2003; Cecelski, 2000), with an exception of a few studies undertaken by Dr. Wamukonya (Wamukonya 2003) and The African Energy Policy Research Network (AFREPREN). There is limited coverage of studies on sub-Saharan African countries.

A preliminary assessment of available global literature on power sector reforms, the World Bank and Energy Sector Management Assistance Programme (ESMAP) - considered as the key institutions behind reforms - have published extensively on the subject. However, most of the literature from these institutions mainly consists of reviews of the status of reforms in the countries region. (see Bacon, 1999; Brook, 2000; Bacon and Besant-Jones, 2001) There has also been some effort to assess the impacts of reforms on the poor but most the assessments of the World Bank and ESMAP appear to largely focus on the effects of reforms on the performance of power utilities and, to a limited extent, on electricity cost (Brook, 2000; Brook and Beasant-Jones, 2000; Foster, 2000). There is very limited assessment of the environmental impacts of power sector reforms in Sub-Saharan Africa (Wamukonya, 2003; Karekezi and Sihag, 2003; Karekezi, et al, 2003; Sarr, et al, 2003; Davidson and Mwakasonda, 2003; Edjekumhene & Dubash, 2002).

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A number of recent global studies (including some sub-Saharan African countries) have attempted to examine the socio-economic impacts of power sector reforms. Initial results from these studies seem to reveal that few of these reform initiatives have resulted in significant

improvement in the provision of electricity services to the poor, especially with regard to rural electrification.

Some analysts contend that, although power sector reforms have produced positive outcomes in a few sub-Saharan African countries, there is some evidence that in many countries, far from reducing energy poverty, market-oriented reforms in particular may have increased energy poverty (Wamukonya, 2003; Karekezi, et al, 2003; Sarr, et al, 2003; Davidson and Mwakasonda, 2003; Edjekumhene & Dubash, 2002). The analysts argue that from the onset, the implementation of market-oriented reforms was not designed to address the electrification of the poor[5], but were explicitly aimed at improving financial and technical efficiency of utilities, facilitating divestiture and guaranteeing future electricity supply in an open globalized energy market (Wamukonya, 2003; Byrne & Mun, 2003; Fall & Wamukonya, 2003; Agbemabiese, Byrne & Bouille, 2003; Lash, 2002; Bouille, Dubrovsky & Maurer, 2002; Dubash & Rajan, 2002; Edjekumhene & Dubash, 2002).

A few ongoing or recently concluded assessments of the "public benefits" (mainly socio-economic benefits) accrued from power sector reforms such as ensuring wider electricity access among the poor have mainly been undertaken by the World Resources Institute, International Energy Initiative, Department for International Development (DFID), Asian Development Bank, UNEP and the Global Network on Energy for Sustainable Development (GNESD). Although findings from these studies are not fully conclusive, they do indicate that reforms have resulted in some adverse impacts on the poor.

1.2 What Does This Study Address?

Traditionally, power utilities in Africa have enjoyed a monopolistic hold over their national electricity industry. There is growing consensus that the monopoly has contributed to the undeniable under-performance in the delivery of electricity services (Karekezi and Kimani, 2002). Power sector institutions are mainly characterised by unreliability of power supply, low capacity utilisation and availability factor, deficient maintenance, poor procurement of spare parts, and, high transmission and distribution losses among other problems. Consequently, the

[5] The lack of focus on the poor is demonstrated by the fact that few of the key institutions involved (Ministries of Energy, electricity utilities and regulatory agencies) keep track of the electrification of the poor.

performance of the power sector was branded unsustainable which, in part, led to the advent of reforms in the African power sector.

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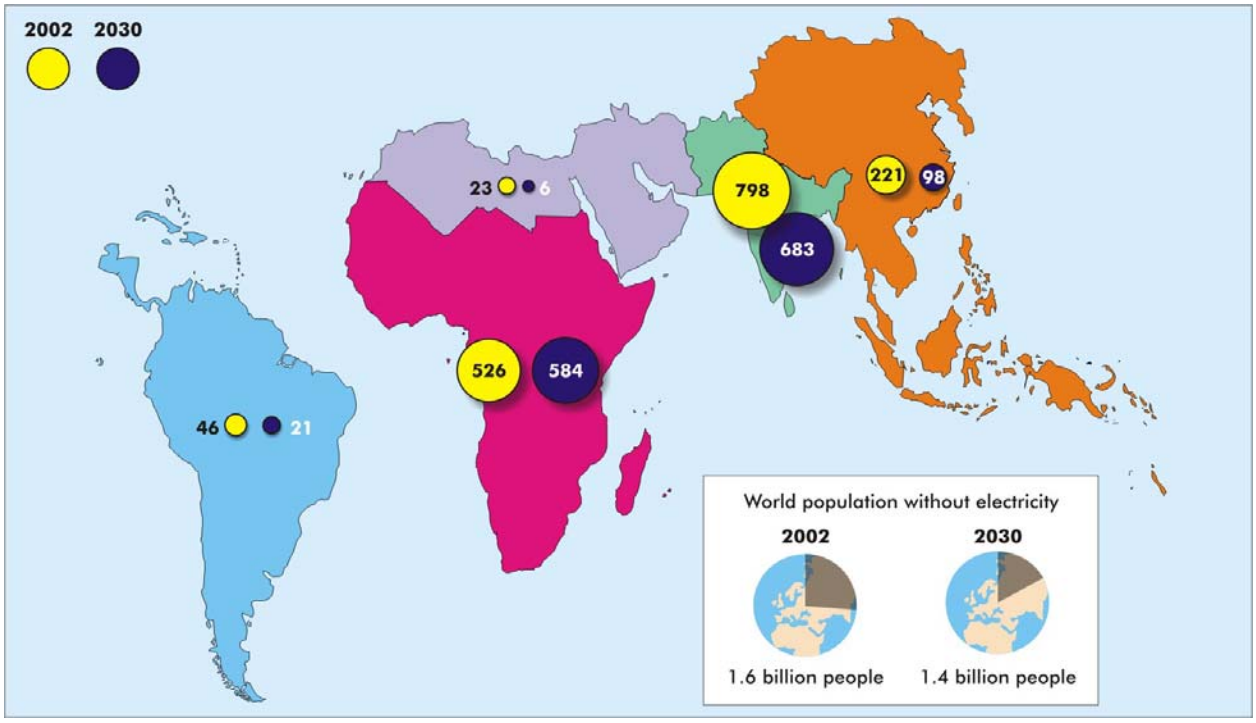
Some proponents of the market-oriented power sector reforms have argued that by making utilities technically and financially efficient, power utilities would be then able to afford provision of electricity to the poor. However, when one compares the current pace of electrification with population growth rates in sub-Saharan Africa, it appears that the region will be the only region in the world whose population without electricity will increase by 2030 (see Figure 1). This is clearly a trend demonstrating that the power sector in the region is not yet a sustainable trajectory.

[6] The lack of focus on the poor is demonstrated by the fact that few of the key institutions involved (Ministries of Energy, electricity utilities and regulatory agencies) keep track of the electrification of the poor.

Figure 1: World Population without Electricity



This study assesses the socio-economic and environmental impacts of power sector reforms especially on the poor and uses the results of the assessment to determine the extent to which reforms have made the power sector in sub-Saharan Africa sustainable. Furthermore, it proposes options that could enhance the sustainability of the power sector.

The study adds value to the limited but growing literature on power sector reforms in sub-Saharan Africa. While past studies have mainly assessed the status and outcomes of power sector reforms, this study adds value by assessing whether the reforms taking place are sustainable. Moreover, the study is one of the very few that have attempted to incorporate environmental concerns within the context of power sector reforms.

1.3 Methodology Used in the Study

Why focus on reforms? Over the past decade and a half, the power sectors of the respective sub-Saharan African have undergone major changes in institutional structure and ownership. These changes were a result of the performance of the power being deemed ‘unsustainable’ in terms of

technical and financial performance; equity often defined as electrification of the poor, and measured by the extent to which renewable and energy efficiency options are widely adopted. It is, therefore, appropriate to assess the extent to which reforms have made the power sector sustainable.

Key specific objectives of the study are to:

Specific Objective 1 – Assess socio-economic and environmental impacts of past and current initiatives in the power sector: This was achieved through literature reviews undertaken in selected countries which provided a broad overview of the power sector. In addition, based on data indicators in appendix I, a limited assessment of the impact of the reforms was undertaken and is provided in Chapter 3 of this report. In addition, selected desk studies were undertaken to evaluate and update past power sector reform initiatives.

Specific Objective 2 – Examine gaps in the legal and institutional framework of past power sector reform initiatives: Key research activities under objective 2 was to analyze gaps in the legal and institutional framework of past power sector reform initiatives. The in-depth assessment of past initiatives also assessed the environmental and socio-economic impacts of power sector reforms in selected Sub-Saharan African countries. This assessment is provided in Chapters 4 and 5 of this report.

Specific Objective 3 - Based on case studies, demonstrate how to integrate environmental and socio-economic issues in power sector reforms: In part, Chapter 7, using case examples, attempts to demonstrate how to integrate socio-economic and environmental concerns into power sector reforms.

Specific Objective 4 – Raising awareness among policy-makers on strategies to improve the power sustainability of the African power sector: A policy dialogue forum bringing together about 30 participants will be organized by UNECA/UNEP to raise awareness among the various stakeholders on the environmental and socio-economic implications of power sector reforms, and to propose and negotiate new frameworks for mitigating identified negative impacts of the reforms. The participants will be high-level decision makers from Government, representatives of the donor community, IFIs and civil society. Selected energy experts from the country study teams and technocrats are also expected to participate.

This study involved 2 sets of activities, namely data compilation and peer reviews. The first set of activities was undertaken by the research teams through data compilation and preliminary literature reviews. This was a challenging task mainly because, as mentioned earlier, there is limited data and literature available on power sector reforms in the region specifically analyzing socio-economic and environmental impacts of reforms. The study attempted to compile and analyze the following indicators many of which could not be adequately addressed:

Table 1: Indicators

Category	Essential Indicators	Optional Indicators (which may not be available)
Economic	- Electrification levels/rates - Electricity consumption per capita - Electrification levels (National, Urban, Rural) - Sources of investments - Reported economic growth rates	- Share of local investment in sector - Ownership of facility (shares –where possible) - Private investment in the sector - Public investment
Technical/Managerial Indicators	- Installed capacity - Annual electricity generation - System losses - Number of customers - Number of employees - Customers per employee - Population growth rates	- % of total demand met - No. of unplanned outages - Numbers laid off - Packages for laid off workers - Other jobs created (number)
Financial	- Annual revenue - Profit/loss - Tariff levels - Debt collection days - Taxes paid	- Bills collection ratio - Other financial ratios - REF collection - Amounts owed – by customer type
Environmental	- Share for RETs (including large hydro) - Share for RETs (excluding large hydro) - Share of fossil fuels - Availability of efficiency/DSM programmes - Whether Environment Impact Assessment (EIA) is a major requirement	- Size of displaced population - Amount of lost vegetation - Is there an electricity regulator with the responsibility to monitor environment indicators - Is there a dedicated power sector environmental Act or policy

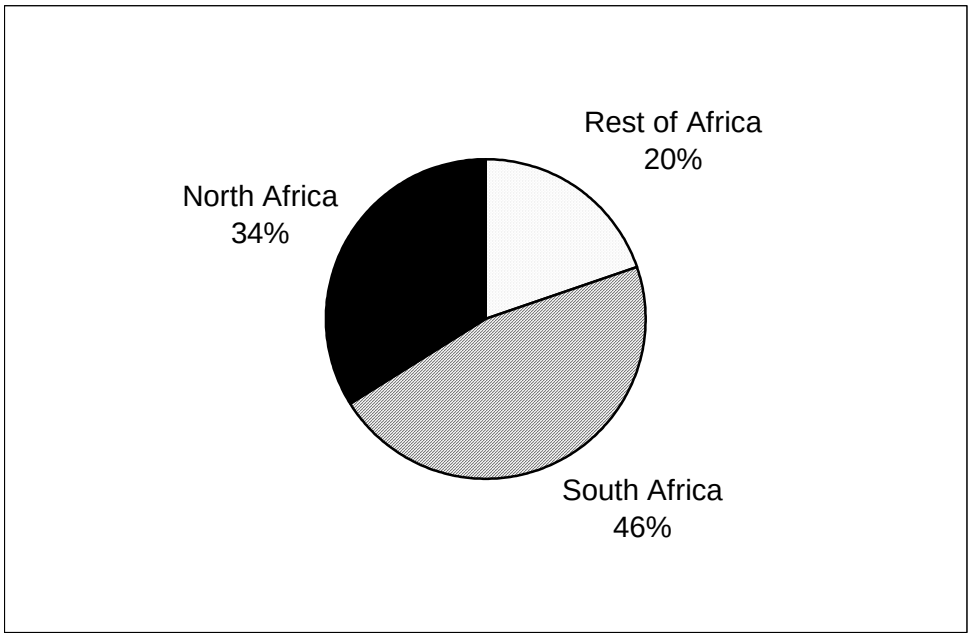
Category	Essential Indicators	Optional Indicators (which may not be available)
	for new generation and transmission projects - Is there an Environmental Act - Is power sector mentioned in the Environmental Act - Is Environment mentioned in the Electricity Act	- Have there been any environment-related complaints
Institutional	- Extent of sector privatization - Extent of sector unbundling - New Electricity Act - Establishment of Regulator & responsibility - Independence of the Regulator • Appointment procedure to the Board • Source of funding - Staffing of regulator - Existence of Rural Electrification (RE) agency - Role of the ministries - Capacity of ministries to meet roles	- Source of regulator staff (where they were working before?) - Contractual stipulations (eg. obligating increased access, etc)

The study covered a total of 12 out of the planned 14 sub-Saharan African countries within a period of 8 months. Country findings were incorporated into this regional report which summarizes key findings and, more importantly, draws emerging trends in the sub-Sahara African power sector. The regional report is organized into 7 chapters. Chapter 1 provides the background on the study. Chapter 2 provides an overview and the status of the power sector. Chapter 3 provides the status of power sector reforms and regulatory measures. Chapter 4 provides an assessment of the socio-economic impacts of power sector reforms. Chapter 5 assesses environmental impacts of power sector reforms. Chapter 6 brings together the key findings of the study and, finally, Chapter 7 recommend possible policy options that could enhance the sustainability of the power sector.

Chapter 2: Overview of the Power Sector

The African power sector is characterized by small systems, with over three quarters of the continent's installed capacity coming from South Africa and North Africa (Figure 2).

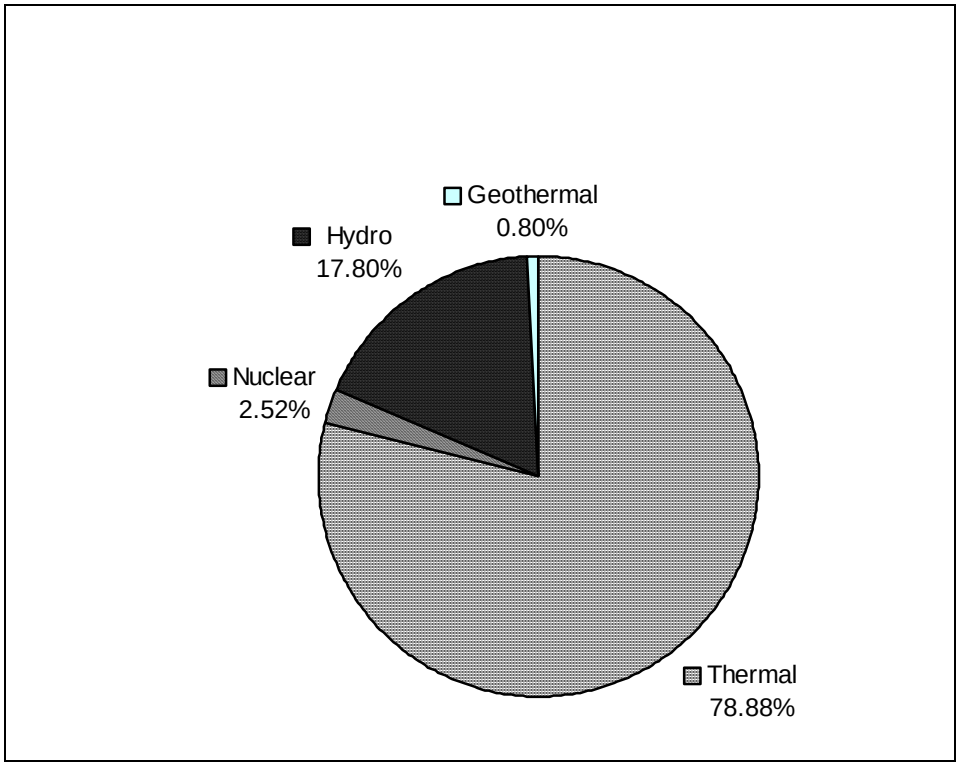
Figure 2: Share of Installed Capacity in Africa (2004)



Source: IEA, 2005

Total electricity production for Africa in 2003 was 507 TWh (IEA, 2005). In overall terms, the bulk of the electricity produced in Africa is from thermal stations, because of the large coal plants in South Africa and oil fired generation units of Nigeria and North Africa (Figure 3). In spite of the massive exploitable hydropower capacity in Africa, its contribution to total power generation is relatively low. Hydropower contributes about 18% of the total power generation in Africa (Figure 3).

Figure 3: Electricity Production in Africa (2004)7



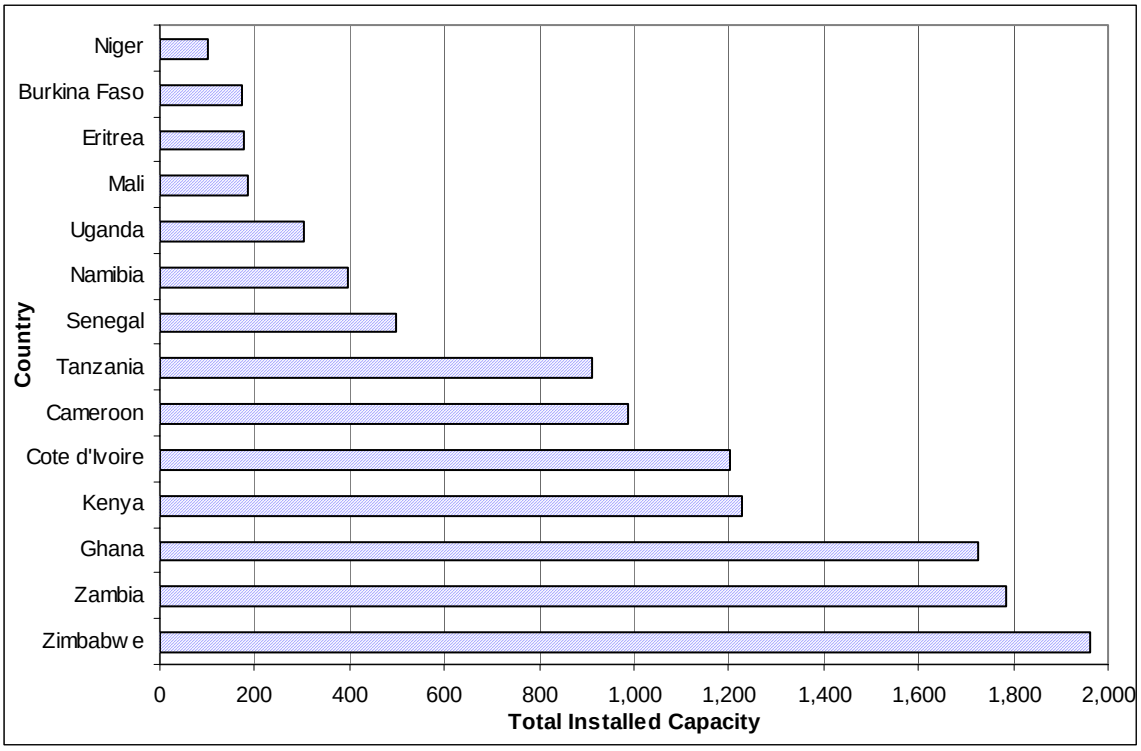
Source: IEA, 2005

Installed Capacity and Electricity Generation

As shown earlier in this chapter, the power systems in the countries covered in this study are relatively small ranging from about 100 MW to nearly 2,000 MW. Similarly, the amount of electricity generated is relatively small. The installed capacity in most of the countries is below 1,000 MW with only 4 countries registering an installed capacity above this figure. In fact, nearly half of the countries covered have an installed capacity below 500 MW as shown in the following graph (Figure 4).

[7] Does not include cogeneration and other off-grid power generators which could total to a significant contribution to the region's power supply. Many cogeneration plants especially in agro-processing industries are used for own consumption (used by plant/factory generating the electricity) and may not be registered in national electricity statistics. For example, in Mauritius, cogeneration accounts for 40% of the country's power supply (Veragoo, 2003)

Figure 4: Installed Capacity by Countries (2003/2004)



Sources: IEA 2004; World Bank 2004; Pineau 2005 a & b, Habtetsion 2005 a & b, Dube 2005 a & b, Kalumiana 2005 a & b, Nyang 2005 a & b, Diarra 2005 b, Bassirou 2005 a & b, Kayo 2005 a & b, Sarr & Sokona 2003, AFREPREN Energy Data Handbook 2004, Kahyoza 2005 a & b, Tse 2005 a & b, SOPIE 2005

2.1 Status of the Power Sector in Sub-Saharan Africa

2.1.1 Status of the Power Sector in the Eastern Africa Region

Kenya

Prior to reforms of the Kenyan power sub-sector in 1996, the sector was dominated by the *de facto* vertically integrated utility: Kenya Power and Lighting Company (KPLC) – started in 1954 - which owned some generation and transmission assets and the entire distribution network in Kenya. Other entities in the sub-sector that owned generation assets only or a combination of generation and transmission assets executed management contracts with KPLC for the management of these assets including the Kenya Power Company (KPC) the Tana River

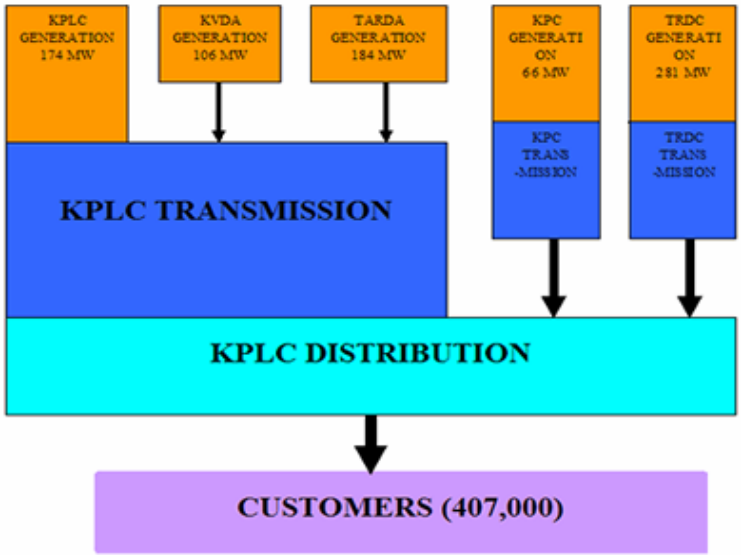
Development Company (TRDC), the Tana and Athi River Development Authority (TARDA) and the Kerio Valley Development Authority (KVDA).

KPC was responsible for geothermal development at Olkaria, the operation of the Tana and Wanjii power stations on upper Tana River and the importation of electricity from Uganda. TRDC was responsible for the development of major hydro-power plants in the Seven Forks area of the Tana River. Both KPC and TRDC were wholly owned by the Government, and were entirely managed and operated by KPLC.

TARDA was setup and mandated to develop the Masinga reservoir and power station as well as the Kiambere hydro-electric power project, both on the Tana river; while KVDA was setup and mandated to develop the Turkwell Gorge hydro-electric power project. Their power stations were, however, operated and managed by KPLC under a lease agreement in which the power generated was sold in bulk to KPLC.

The Ministry of Energy had the oversight, co-ordination and management responsibility for all the sector entities in the power sub-sector including policy, regulatory, commercial transactions and the day to day operations of the entities. Owing to its non-commercial orientation the Ministry set the bulk and retail tariffs at sub-economic levels with a view to promote the political and welfare agenda of the Government without due regard to commercial and efficiency considerations. This plunged the power sub-sector into significant financial losses hence relied heavily on the exchequer for support.

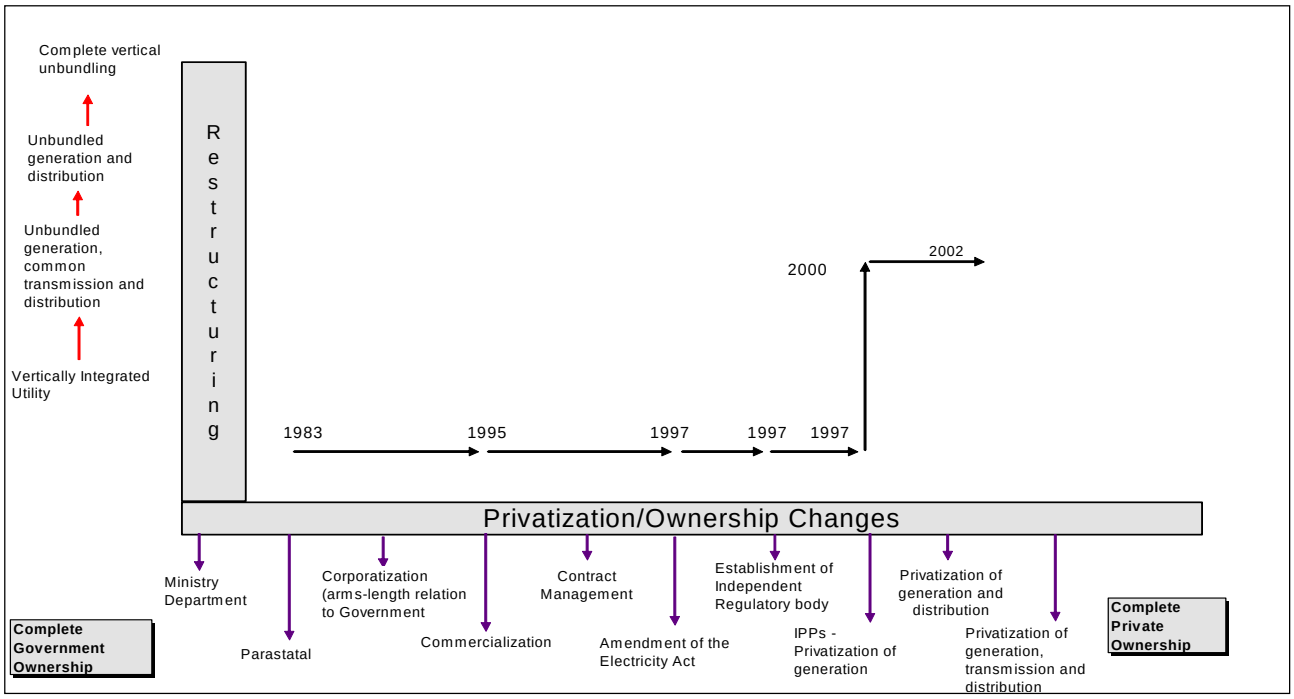
Figure 5: The Structure of the Electric Power Sub-Sector before Reforms and Restructuring (Ca. 1996)



Source: Nyang', 2005

Power Sector reforms began in 1996 when the government realised that there was an urgent need to reform and restructure the sub-sector in order to prepare it to tackle the challenges facing it, in particular the need to attract adequate funding, especially from the private sector, for operations and development. Amongst the reforms carried out include a review of the legal and regulatory framework, pricing of electricity, sector management, and restructuring the industry, as well as the institutional framework. The following figure (Figure 6) shows how reforms have taken place in Kenya.

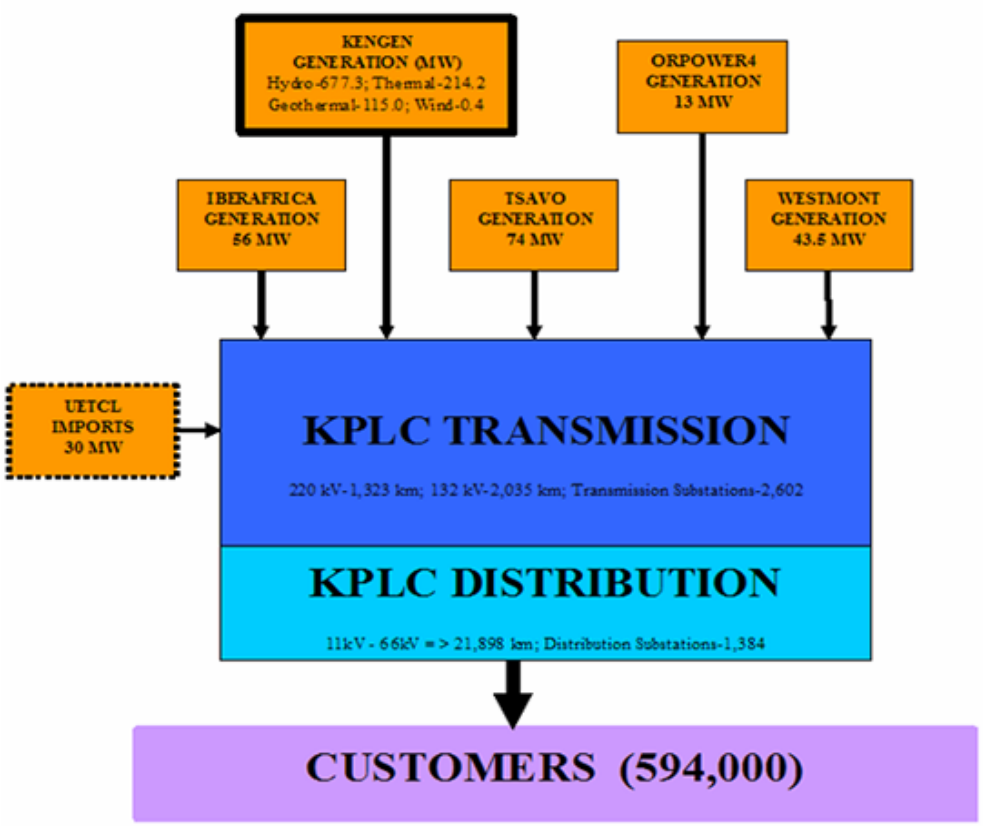
Figure 6: Reform Structure in Kenya's Power Sector



Compiled by authors

With the implementation of reforms, KPLC is now transformed from the de facto vertically integrated structure into a single buyer (*Purchasing Agency*) model in which it purchases bulk power from IPPs and the public sector generation company under long term bilateral Power Purchase Agreements (PPAs). KPLC has however retained the transmission and distribution functions all over the country as shown in the following figure (Figure 7).

Figure 7: The Structure of the Electric Power Sub-Sector after Reforms and Restructuring (Ca. 2002)



Source: Nyang', 2005

Reforms also brought about separation of policy, regulatory and commercial functions. The policy formulation function was retained by the Minister for Energy, while regulatory functions were passed on to an autonomous regulator: Electricity Regulatory Board (ERB); and commercial functions in respect of generation, dispatch, transmission, distribution and supply to various commercial entities.

Generation is now liberalised thereby opening the way for Independent Power Producers (IPPs) to participate in generation with at least 174MW coming from the IPPs. Public sector generation was consolidated under a new generation company: Kenya Electricity Generation Company (KenGen), which took over all the generation assets formerly owned by KPLC, KPC, TRDC, TARDA, and KVDA comprising hydro, wind and geothermal power plants altogether 900 MW of installed capacity.

Prior to liberalisation all the electric power consumed was provided either by wholly state owned utilities, or utilities in which the state had a majority shareholding. Private sector participation in terms of ownership of generation facilities by Independent Power Producers (IPPs) was formalised after the new electricity law was promulgated. The IPPs were introduced into the sub-sector as a means of redressing the challenge of capacity shortfalls. The growth in supply capacity virtually came to a halt in the early 1990s while the suppressed demand continued to grow at 6-7% per annum thereby stretching the capacity of the existing system to the limit. The system was thus vulnerable to and could not withstand supply shocks and as a result performed poorly in terms of system availability and reliability.

The number of connections rose from 265,413 in 1990 to about 686,195 in 2004. In 1997 there were 426,500 connections, from which it is apparent that the number of connections had grown by about 61% from 1990. The growth in the number of connections in the period between 1997 which serves as the datum year of reform, and 2004 was 61%. Therefore growth in the connections maintained the same trend from the year 1997 which is the chosen benchmark year for the reforms.

Table 2: Number of customers connected to Electricity in Kenya

	Customers (KPLC)	Customers (REP)	Customers (TOTAL)	New Connections
1990	246,346	19,067	265,413	
1991	262,521	24,491	287,012	21,599
1992	277,622	29,513	307,135	20,123
1993	294,520	34,561	329,081	21,946
1994	310,916	40,731	351,647	22,566
1995	326,738	43,718	370,456	18,809
1996	355,372	51,151	406,523	36,067
1997	371,258	55,242	426,500	19,977
1998	394,985	57,978	452,963	26,463
1999	411,235	61,436	472,671	19,708
2000	439,281	66,670	505,951	33,280
2001	465,361	71,718	537,079	31,128
2002	514,680	78,941	593,621	56,542
2003	556,099	87,175	643,274	49,653
2004	592,753	93,442	686,195	42,921

The growth in REP connections in the early 1990s i.e. pre-reform averaged 18.0%; however, in the period between 1997 and 2004 i.e. post-reform period the growth in REP connections

declined to an average of only 7.8%, despite of reforms introducing a 5% levy on all electricity sales which raised an average of about KShs. 1.2 billion annually for the REP kitty.

The per capita consumption of electricity showed a declining trend from a high of 134 kWh /capita in 1997 to 119 kWh/capita in 2003 following the institution of reform. This may be attributable to, among other factors, the general decline in economic performance in Kenya during that period and the mismatch between population growth and GDP growth. During the period under consideration Kenya experienced some of the lowest GDP growth rates including periods in which the economy shrank. The industrial and manufacturing sector which accounts for nearly two thirds of the electricity consumption, and 25% of the GDP performed very poorly during the period under analysis. The correlation between electricity consumption and GDP growth for Kenya, whose industrial structure tends to be energy intensive, is thus fairly strong. The per capita consumption as a measure of sub-sector performance in the post-reform era paints a picture of decline and stagnation.

Table 3: Per capita Electricity Consumption and GPD growth rates

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Electricity Consumption KWh/capita	123.1	124.6	116.6	118.2	119.6	122.3	128.8	133.8	133.4	132.0	110.0	112.9	117.7	119.6	126.0
GDP Growth at constant prices	4.3%	2.1%	0.5%	0.2%	3.0%	4.8%	4.6%	2.4%	1.8%	1.4%	0.6%	4.4%	0.4%	2.8%	4.3%

There has been an increase in the installed capacity as a result of the introduction of IPPs with Iberafrica Power Limited and Westmont Power together adding an extra 88 MW of capacity to the system in 1997 thereby providing much needed power to the capacity constrained system. In addition Iberafrica and OrPower4 Inc each added 12 MW in 2000 and Tsavo Power Ltd 74 MW in 2001. Public sector generation under KenGen added 74 MW of capacity in 1999 and a further 70 MW in 2003.

Table 4: Installed capacity and Annual Electricity Generation

Year	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Installed Capacity (MW)	735.6	841.6	817.8	817.9	820.8	821.7	817.9	815.0	887.1	885.6	1048.4	1173.1	1194.6	1162.6	1228.4
Annual Generation (GWh)	3148	3301	3386	3599	3732	3866	4119	4296	4516	4637	4461	4081	4564	4750	5035

There is however, low electrification levels which is attributed to stagnation in household connections. An analysis of an 11-year period between 1991 and 2002 shows that electrification nationwide only increased by approximately 2 percentage points (Table 5):

Table 5: Percentage of Households connected to electricity in Kenya

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002
National	4.1	4.2	4.4	4.5	4.6	4.8	4.9	5.0	5.1	5.4	5.5	6.1
Urban	15.9	16.3	16.7	17.0	17.3	18.1	18.2	18.7	19.1	20.0	20.4	22.7
Rural	0.4	0.5	0.5	0.6	0.6	0.7	0.7	0.7	0.8	0.8	0.8	0.9

Sources: Calculations based on data from World Bank 2001, KPLC 1992, 1997, 2001/2002; Kinuthia, 2003

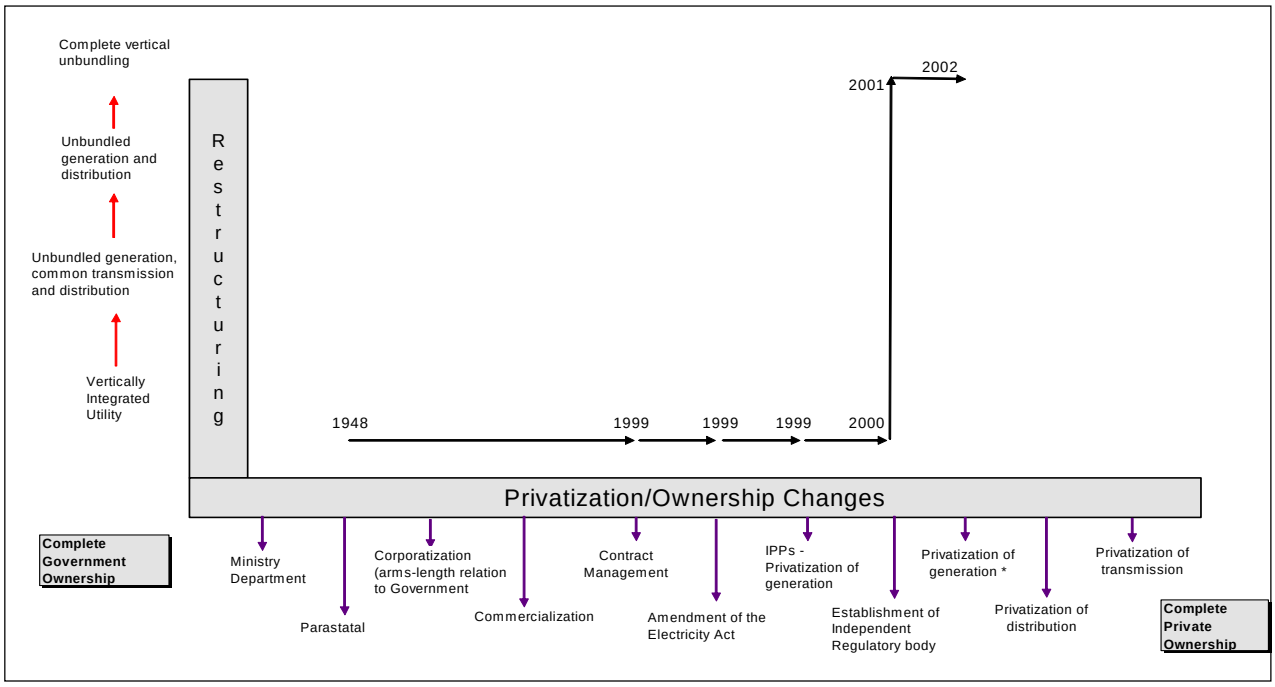
Uganda

The Ugandan power sector was previously dominated by a state-owned, vertically integrated Uganda Electricity Board, UEB, which has since been unbundled into three limited liability companies, namely, the Uganda Electricity Generation Company, the Uganda Electricity Transmission Company and the Uganda Electricity Distribution Company responsible for generation, transmission and distribution, respectively. The Ugandan government has been actively pursuing active negotiations with various investors, to increase in the level of private investment in the sector. Concessions for generation was awarded to Eskom Enterprises in 2002, while the concessions for distribution were given in late 2004 to Umeme ltd (also a subsidiary of EE).

The Electricity Act of 1999 that outlines the Government's policy on electricity production, makes specific provisions for rural electrification and empowers the Minister of Energy to plan and initiate strategies that promote electricity use in the rural areas. The Rural Electrification Fund recently established in line with provisions of the Electricity Act is expected to be instrumental in achieving equitable access to electricity throughout the country.

In 1997, the Government of Uganda developed a Strategic Plan for transforming the Ugandan power sector into a financially viable electricity industry, in order to enable it to supply reasonably priced and reliable power. This new Strategic Plan placed special emphasis on the role of competition in promoting efficiency within the power sector and on private sector participation as a key driver for enhancing the performance of the country's electricity industry. The following figure (Figure 8) shows the evolution of the power sector reforms to date.

Figure 8: Reform Structure in Uganda's Power Sector



* *Concession awarded to Eskom Enterprises of South Africa*

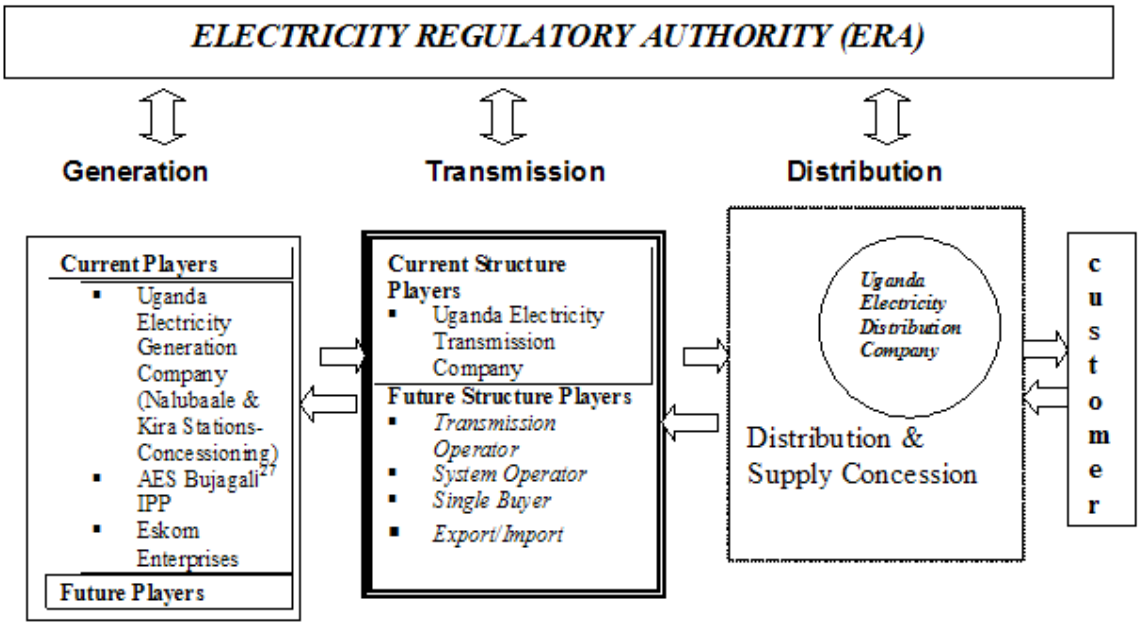
Compiled by authors

One of the aims of the reforms was to transform the sector into a profitable and financially viable industry with priority attention given to reducing system losses. Over the last five years the systems losses have averaged 34%. The bulk of the systems losses (on average over 60%) are due to technical losses resulting from the long distances between points of production and consumption and the need for network rehabilitation. As a result of the refurbishment and rehabilitation programs and the construction of new lines, the losses are expected to decline to about 10-15% by 2010.

In 1999, a new electricity legislation was enacted, providing for the liberalisation of the power sector, the introduction of new private sector electricity infrastructure providers and the privatisation of existing assets. The legislation also provided for the establishment of an autonomous authority to regulate the electricity industry and a Rural Electrification Trust Fund (RETF) to promote increased access to electricity, particularly for the poor. In 2001 the Uganda Electricity Board (UEB) is unbundled and three companies created and registered, namely: The Uganda Electricity Generation Company Ltd; The Uganda Electricity Transmission Company Ltd;

and, The Uganda Electricity Distribution Company Ltd (UEDCL). After the reforms, the entire institutional structure has been transformed as shown in Figure 9.

Figure 9: Structure of the Power Sector in Uganda



Household electricity consumption was on the declined at all levels (national, urban and rural) until around the year 2000 when the trend picked up an upward turn. The utility's inefficiency is partly to blame for the deterioration in consumption levels. Between 1997 and 2002, the electricity losses have been about 34% on average – almost 3 times the nominal target for utilities in developing countries. However, the introduction of a new management team to the UEB has led to a UShs 4 billion profit and an increase of 20% in debt collection (Bidasala, 2001) in less than 2 years which has also considerably reduced the debt collection days. The total electricity sales in Uganda has been on the upward trend almost doubling to 1038GWh in 2003 from 522GWh in 1995. The following table (Table 6) shows the trends in the performance of the Uganda power sector. The table provides the trends of power sector performance in Uganda

Table 6: trends of power sector performance in Uganda

Year	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Electricity consumption per capita (kWh)	27	27	35	34	34	32	38	40	42	44
Electricity installed capacity (of which):										
Total (MW)	174.6	174.6	183.2	182.3	183.3	183.4	263.0	263.0	303.0	303.0
Hydro (MW)	172.6	171.3	181.3	180.3	181.3	181.3	261.0	261.0	301.0	301.0
Thermal (MW)	2.0	3.3	1.9	2.0	2.0	2.1	2.0	2.0	2.0	2.0
Electricity generation										
Total (GWh)	1,017.4	1,057.5	1,130.5	1,248.2	1,233.2	1,341.7	1,540.3	1,577.8	1,711.6	1,759.7
Hydro (GWh)	1,016.0	1,056.0	1,129.0	1,247.0	1,232.0	1,340.5	1,539.1	1,576.6	1,710.4	1,758.5
Thermal (GWh)	1.4	1.5	1.5	1.2	1.2	1.2	1.2	1.2	1.2	1.2
Electricity sales										
Total (GWh)	488	522	677	701	706	702	843	922	877	1,038
Utility Data										
Number of utility employees	3,155	3,248	3,283	2,993	2,028	2,025	1,903	1,346	1,325	1,429
Number of utility customers	107,620	101,407	123,049	142,327	159,205	164,225	180,234	200,217	224,863	244,245
Number of customers per employee	34	31	37	48	79	81	95	149	170	171
Electricity generation/employee (MWh/employee)	322	326	344	417	608	663	809	1,172	1,292	1,231
Electricity sales/employee (MWh/employee)	155	161	206	234	348	347	443	685	662	726
System losses (%)	36	40	31	33	34	40	34	34	37	28
Debt collection period (days)	206	356	330	259	322	363	369	281	224	194

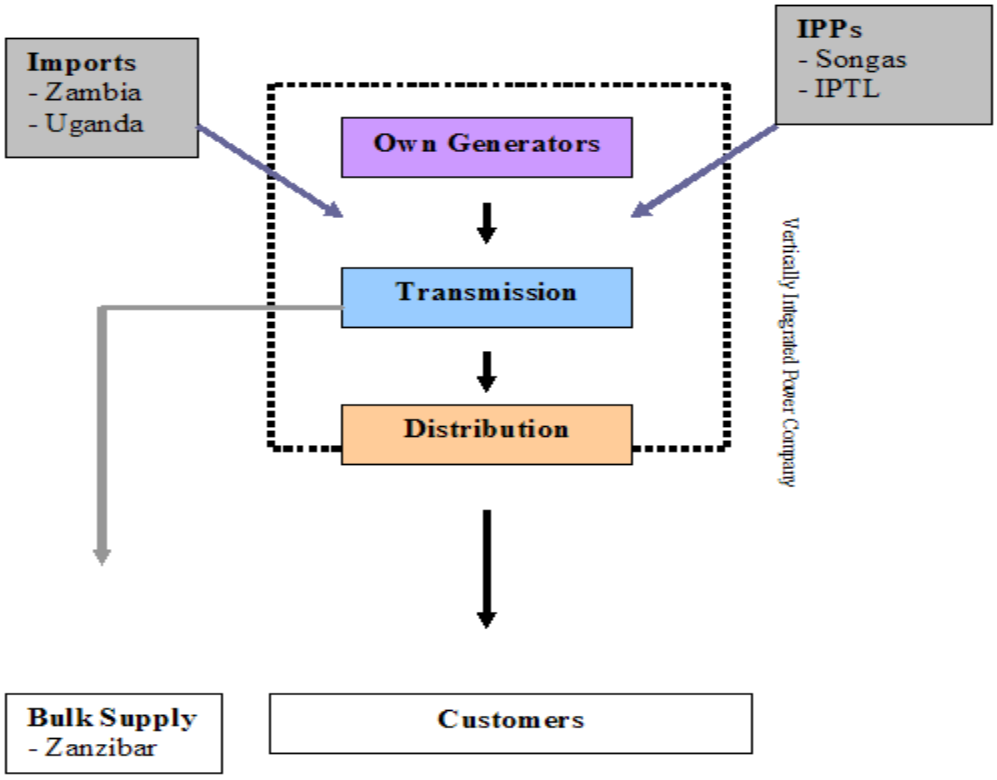
Sources: Okumu, 2003; Opio, 2005

Tanzania

The Ministry of Energy and Minerals (MEM) is in charge of the Minerals, Power and Petroleum development in the Tanzania. Three parastatals exist under this ministry, namely, State Mining Corporation (STAMICO) – responsible for mineral exploration and production activities, Tanzania Petroleum Development Corporation (TPDC) – currently responsible for exploration and production of petroleum products, and Tanzania Electric Supply Company Limited (TANESCO) – responsible for generation, transmission, distribution and sale of electricity. All of these were by law monopolies in their respective sectors. To date the monopoly has been abolished and private players have joined the sector, especially in the most attractive areas like mining and distribution of petroleum products. The role of the Ministry spans from policy formulation to regulation and control, including (a) overseeing activities of the utility, (b) appointing board members, (c) defining social policies, and (d) issuing licenses to IPPs and IPDs. The private sector, of course co-existed, but with generation for own use.

TANESCO, the only power utility in Tanzania, is wholly owned by the State, was established under the Company Ordinance Act of 1931 in 1964 after nationalization of the power supply industry by then under two private electricity distribution companies. It has been operating since then as a vertically integrated public utility responsible for generation, transmission, distribution and commercial services of electricity in the country. Following the 1992 policy change to abandon monopoly by TANESCO, IPPs have joined the generation segment of the sector and sell electricity to TANESCO through the Power Purchase Agreements.

Figure 10: Structure of the Power sector in Tanzania



The reform process in Tanzania were driven by the need to create enabling environment for an efficient and sustainable power sector. Amongst the reform efforts by the government include:

- Passing a declaration on policy change to abandon monopoly (1992) which provided for an individual, a cooperative or any private agency to engage in generation, distribution and selling of electricity to consumers (Kahyoza, 1994).
- Enactment of an Electricity Law (2004)-still in a draft form- which is to facilitate the development and promotion of, and increased private sector participation, in the expansion of electricity services;
- To promote enhanced efficiency in and to maintain the safe operation of the electricity sector;
- To facilitate the reorganization and restructuring of and to provide for a framework for the effective regulation of the electricity sector; and
- To provide for related matters.

In April 2000, the Government created an independent multi-sectoral regulatory agency, Energy and Water Regulatory Authority (EWURA) to regulate the energy and water utilities .In October 1999 the Government of Tanzania approved a new electricity industry policy and restructuring framework with the aim of unbundling the generation, transmission and distribution of electricity.

Following the policy change two independent power producers (IPPs) have been licensed, namely, Independent Power Tanzania Limited (IPTL) and Songas Limited. The former has constructed and operates a 100MW diesel-fired power plant near Dar es Salaam, while the latter has developed and operates the natural gas infrastructure with a throughput of 70 MMscf/d, generating 180MW and supplying 8 industrial customers in Dar es Salaam. There is also another IPP- TANWAT-supplying electricity from a wood-wasted fired cogeneration power plant Njombe. TANWART supplies 2.5MW to the mini-grid in Njombe.

It is estimated that about 39% of the urban population has access to electricity, and only about 2% of the rural population (Esmap, 2005; HBS, 2000) do access electricity in Tanzania. Information from TANESCO indicates that normally TANESCO connects 20,000 to 30,000 customers per year. The Management Contractor has an ambitious plan to connect up to 100,000 customers per year (TANESCO, 2004). However, a much more aggressive connection strategy may be required to cope with the current population growth.

With the commissioning of the IPTL plant in 1999, and subsequent switching to the gas generation of the Ubungo turbines, per capita consumption of electricity picked up a steady increase to above 90 kWh in 2004. The number of customers in Tanzania has increased from about 221,000 in 1992 to 550,000 in 2004, an average of about 27,800 new connections per annum. The corresponding electricity access has increased from 5.1% in 1992 to 9.0% in 2004. The following table (Table 7) provides data on the performance of the Tanzanian power sector.

Table 7: Trends of the Power Sector Performance in Tanzania

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Electrification Levels (%):										
- National	5.5	5.8	7.2	7.3	7.5	8.0	8.1	8.4	8.8	9.0
Annual electricity	1865	2007	1954	2186	2356	2522	2782	2892	3179	3393

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
generation (GWh)- (incl. Imports)										
Electricity consumption per capita (kWh)	66.0	69.1	65.4	71.2	74.6	77.7	83.4	83.6	89.4	92.8
Installed Capacity (MW)										
Total Installed Capacity	663.3	663.3	663.3	591.3	691.3	871.3	871.3	871.3	871.3	911.3
Hydro (%)	57.4	57.4	57.4	64.4	55.1	64.4	64.4	64.4	64.4	61.6
Thermal (%)	42.6	42.6	42.6	35.6	44.9	35.6	35.6	35.6	35.6	38.4
Others (%)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
System Losses (%)	12.0	10.5	13.3	21.1	25.8	26.3	26.8	24.1	26.8	24.8
Total Electricity demand (GWh)	1,865	2,007	1,954	2,186	2,356	2,522	2,782	2,892	3,179	3,393
% of electricity demand met by supply***	99.9	99.8	99.8	99.8	99.8	99.8	99.0	98.8	98.7	98.6
Staffing Levels										
Number of employees	7,440	7,569	7,269	7,107	7,223	6,916	6,540	6,433	4,991	4,857
Number of laid-off workers***	0	0	0	0	0	0	0	0	1,319	0
New jobs created***	-53	129	-300	-162	116	-307	-376	-107	-1,442	-134
Customers										
Number of customers	256,903	280,468	359,790	371,233	393,440	431,722	450,947	485,995	523,000	550,863
Customers per employee	35	37	49	52	54	62	69	76	105	113
Staff costs as a percentage of revenue (%)	0.0	0.0	8.7	9.5	0.0	9.5	8.5	6.6	6.3	8.9
Economic										
Economic growth rate(%)	5.8%	3.9%	2.4%	1.9%	4.1%	3.4%	5.4%	3.0%	0.6%	6.5%
Population (Millions)	28.3	29.1	29.9	30.7	31.6	32.5	33.4	34.6	35.6	36.6
Population growth rate(%)	2.8	2.8	2.8	2.8	2.8	2.8	3.7	2.8	2.8	
Financial										

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Annual revenue (M.US$)	153.0	185.0	171.0	177.0	170.0	164.0	159.0	153.0	168.8	181.0
Profit/Loss (M.US$)	(47.8)	(6.2)	(5.0)	(21.4)	-	(77.4)	9.0	(90.7)	(180.8)	(60.9)
Tariff Cost:										
* Local currency (TSh/kWh)	0	0	40	28	0	0	38	48	60	78
* US$ (USc/kWh)	0	0	6	4	0	0	4	5	6	8
Taxes paid (MUS$)	0.4	0.5	0.0	0.8	0.0	9.9	100.7	52.3	46.6	0.0
Debt collection days	259	284	315	336	413	337	208	179	0	0
Environmental										
Share of RETs of total electricity supply (including large hydro) (%)	57.4	57.4	57.4	64.4	55.1	64.4	64.4	64.4	64.4	61.6
Share of RETs of total electricity supply (excluding large hydro) (%)	1.3	1.3	1.3	1.5	1.3	1.0	1.0	1.0	1.0	1.0
Share of fossil fuels of total electricity supply -%	17%	13%	25%	5%	8%	15%	7%	6%	20%	39%

Eritrea

The Eritrea Electric Corporation (EEC) is a public vertically integrated utility that operates two systems, namely the Interconnected System (ICS) which covers 89% of its electricity business and the Self contained Systems (SCS) accounting for the 11%. The total firm generating capacity of electricity at present is over 155 MW of which the national utility, the EEC, accounts for around 134 MW while the remaining comes from either public institutions like Assab Petroleum Refinery, Assab Port Administration, small municipalities in remoter towns, or private entrepreneurs with smaller gensets. There was an increase of about 5,500 of new customers every year between 1993 and 1997, but slowed down substantially in 1998-2000, indicating a low connection rate as a result of the war between Eritrea and Ethiopia during those years; this has improved significantly since 2001. The EEC firm capacity that stood at around 26 MW in 1991 was more than doubled by 1996, but showed little change in the years that followed. With the commissioning of the Hirgigo Power and Transmission Expansion Project in 2003, the EEC firm capacity has increased by 84 MW, bringing the total firm capacity of EEC to 134 MW.

Besides the national effort to develop conventional power generation and supply systems, due attention has been given to the introduction and development of renewable energy technologies. Although in the future the prospect could be good, the contribution of non-biomass renewable energy resources has so far been negligible in the national energy balance. In summary, the followings are the major achievements of the power sector since the Liberation of the country in 1991.

- Power generation has increased from < 30 MW in 1991 to around 134 MW by 2005 and per-capita electricity consumption increased from as low as 16 kWh to over 60 kWh at present;
- The length of transmission lines has increased from <150 km to over 350 km;
- The length of distribution lines has increased from 800 km to over 1300 km;
- Rehabilitation of power distribution system initiated in Asmara and completed in Massawa;
- Wind and solar resources assessment from 25 meteorological stations is underway;
- Over 2000 solar PV systems installed with an aggregate capacity of over 600 kW
- Pilot wind energy applications project is being implemented;
- Dissemination of improved stove is in progress with 29,000 installed by 2004

- Energy Laws, Regulations and Standards have been enacted.

Although it is expected that the Eritrea Electric Corporation will continue to provide generation, transmission and distribution of electricity in the medium term, the Government's vision is for Independent Power Producers (IPPs) and Distributors (IPDs) to penetrate the generation and distribution systems. The transmission system will remain under public ownership with one system operator (SO). The Government has promulgated in May 2004 two Proclamations as the first steps towards reforming the power sector. Electricity Proclamation No. 141/2004 has the objective of promoting efficiency, safety, environmental protection and private sector involvement in the power sector. Proclamation No. 142/2004 for the Establishment of the Eritrea Electric Corporation (EEC) has the purpose of commercialising the public utility to give it more autonomy in its operations and to contribute to the socio-economic development of Eritrea by providing efficient, dependable, cost-effective and environmentally safe production, transmission and distribution of electricity to the public.

Eritrea is also embarking on an extensive rural electrification programme of which between 1999 and 2001, around 14,100 households in 27 villages and 4 towns benefited from electrification, which was partially financed by Sida.

The steady growth of the power supply and per-capita consumption that has been witnessed in the last nine years is a manifestation of the post-liberation development trend in Eritrea. The reliability of EEC's electricity supply is excellent compared with the institutional or private gensets erected in the rural areas of Eritrea. For instance, during 2003 the frequency of power interruptions was 42 with cumulative duration being only 9 hrs out of 8760 hours in a year. EEC's financial performance has weakened largely because of oil price increases despite capital restructuring. The Government and EEC began to carry out the EEC's capital restructuring in FY 2004 to reflect the actual level of assets employed to meet its business demand. In total the Government declared 800 Million Nakfa (53.3 Million USD) as equity capital for EEC which was otherwise a debt burden for EEC. The restructuring improved EEC's financial position as expected.

Table 8: Trends of the Power Sector Performance in Eritrea

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Electrification Levels (%):										
- National	22.9	24	25.4	26.5	27.8	29.2	30.7	32.2	33.8	34.1
- Urban	80.6	80.7	80.1	80.3	80.1	80.2	79.8	3	78	78.2
- Rural	2.1	2.2	2.3	2.5	2.6	2.7	2.7	78	3.2	3.3
Annual electricity generation (GWh)	144.67	161.00	179.70	186.03	204.61	201.43	224.44	249.10	264.06	273.00
Electricity consumption per capita (kWh)	43.5	43.7	48	46.8	48	47.2	59	60	62.5	58
Installed Capacity (MW)										
Total Installed Capacity	100	103	92	92	92	127.77		129.03	173.9	176.03
Hydro (%)	0	0	0	0	0	0	0	0	0	0
Thermal (%)	99.9	99.6	99.3	99	99	99		99.4	99.4	99.3
Others (%)	0.10	0.40	0.70	1.00	1.00	1.00		0.60	0.60	0.70
System Losses (%)	16.24	17.76	18.01	20.57	18.65	19.2	17.23	17.45	16.51	17
Staffing Levels										
Number of employees	789	787	778	756	940	881	782	803	771	1031
Customers										
Number of customers	78,000	85,250	91,096	94,380	96,003	96,186	102,424	103,169	109,351	113,103
Customers per employee	99	108	117	125	102	109	131	128	142	110
Staff costs as a percentage of revenue	9.00%	6.60%	8.40%	10%	11.6%	10.70%	8.2%	7.4%	6.0%	8.00%
Economic										
Economic growth rate(%)	7.0	7.0	8	4	0.8	-8.2	1.1	-1.2	NA	NA

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Population (Millions)	2.8	2.9	3.01	3.1	3.2	3.3	3.4	3.5	3.6	3.71

The following table (Table 9) provides the trends in the financial performance of the Eritrean power sector.

Table 9: Trends of the Financial Performance of the Power Sector in Eritrea

Financial	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
Annual revenue (US$ Millions)	15.42	18.06			19.73		18.33	18.48	22.44	28.4
Profit/Loss (US$ Millions)										-1.086
Tariff Cost (Average):										
* Local currency (Nakfa/kWh)				0.83	0.83	1.15	1.2	1.19	1.52	1.76
* US$ (cents)/kWh				8.6	8.52	11.21	8.51	8.31	11.3	11.7
Debt collection days (accounts Receivable in days)				109	51	77	50	67	89	108
Environmental										
Share of RETs of total electricity supply (including large hydro)	0.10	0.40	0.70	1.00	1.00	1.00	1.00	0.60	0.60	0.70
Share of RETs of total electricity supply (excluding large hydro)	0.10	0.40	0.70	1.00	1.00	1.00	1.00	0.60	0.60	0.70
Share of fossil fuels of total electricity supply	99.9	99.6	99.3	99	99	99	99	99.4	99.4	99.3

2.1.2 Status of the Power Sector in the Southern Africa Region

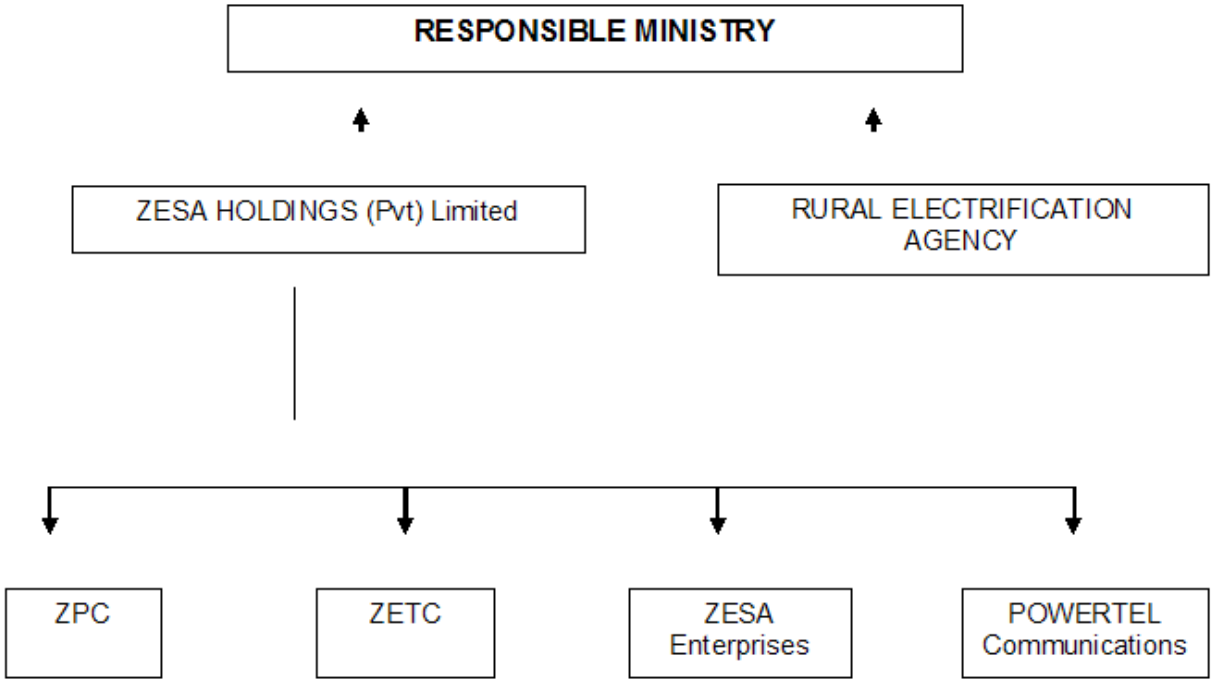
Zimbabwe

Prior to the amalgamation process that took place in 1985, the power sector in Zimbabwe was vertically integrated and connected with the Zambian power system. The Central African Power Corporation (CAPCO) produced hydro power on behalf of the two countries. The Electricity Supply Commission (ESC) was the body responsible for the transmission of electricity in Zimbabwe and the municipalities were responsible for distribution in the major cities.

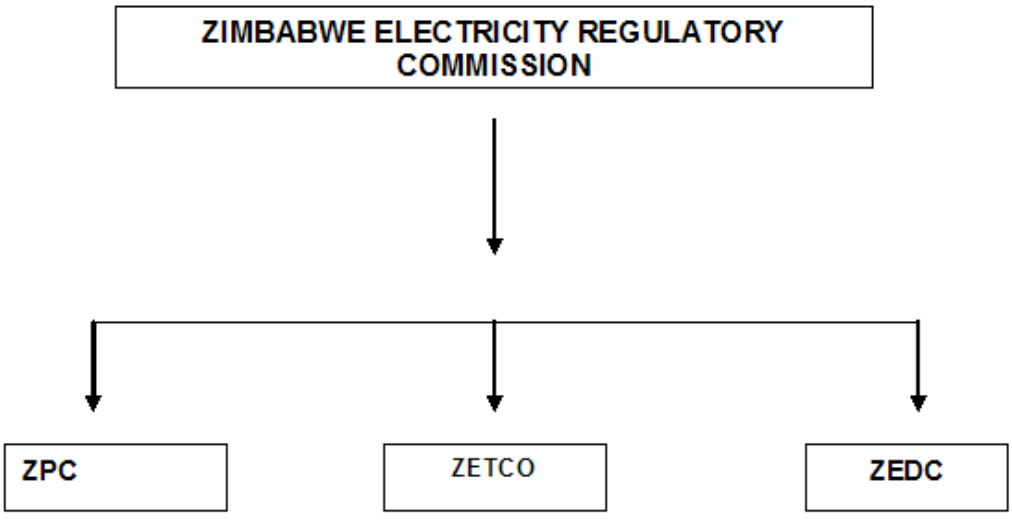
The Zimbabwe Electricity Supply Authority (ZESA) was established through the Electricity Act of 1985 as a vertically integrated monopoly responsible for generation, transmission and distribution. In October 1996 the Zimbabwe Power Company was formed as a wholly owned of ZESA. Its major function was to enter into new generation projects or to act as an investment vehicle on generation projects on behalf of ZESA

Since 1985 power sector reforms have been going on and the major driver have been the desire by Government to see the sector playing a key role as a catalyst to the economic growth of the economy. The Electricity White Paper formed a blue print of the reforms that have taken place in the Zimbabwean power sector. The White Paper envisaged that reforms in the power sector would be done in stages. A new regulatory environment was ushered in governed by three Acts of Parliament. The Commercialisation Act of 2001 empowered the responsible Minister to form successor companies to ZESA. The Rural Electrification Act 2001 enabled the establishment of the stand-alone Rural Electrification Agency responsible for the rural electrification expansion.

Figure 11: The current structure of the Zimbabwean power sector



Regulation of the Power Sector



The Zimbabwe Electricity Regulatory Commission (ZERC) is at the centre of the electricity supply industry. It is responsible for licensing all the key players and building a competitive business environment which allows the entry of private sector players.

In 2000 Zimbabwe was ranked second in terms of average national electrification in East and Southern Africa. In terms of regional performance it can be recognised that Zimbabwe and South Africa are doing well but in terms of total electrification of the country, however, a lot still needs to be done to make electricity accessible to the majority of the rural people.

ZESA's general performance in early 1990s constrained by operational inefficiencies as the utility sought to streamline its operations. The severe drought also worsened the situation. There was however, marked improvement in performance from 1995 following the programmes which were put in place to improve technical and financial performance. It can be seen from the Table 10 that there has been a general reduction in the debt collection days. The electrification of rural areas increased steadily but the rate of increase was slow with 60% of the population having no access to electricity. Table 10 below shows performance indicators which show the general trend of the performance the power sector.

Table 10:Trends in the performance of the Zimbabwean power sector

Year	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Installed Capacity (MW)	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961	1,961
Hydro (%)	666	666	666	666	666	666	666	666	666	666	666	666
Thermal (%)	1295	1295	1295	1295	1295	1295	1295	1295	1295	1295	1295	1295
Electricity Generation (GWh)	10282	8760	9544	10123	10495	11311	11891	12363	12090	11972		
System Losses (%)	8.6	11	12.1	11	11	10.8	10.4	12.8	13.2	14.6		
National Electrification Rate (%)	28	29.4	31	32	34	35	36	39	39	40		
Urban	69	67	69	72	70	74	78	80	84.0	84.0		

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Electrification (%)												
Rural Electrification (%)	11	14	15	14	17	16	15	18	18.0	19.0		
Electricity Consumption per capita	931	948	924	927	839	791	774	827	874	831		
Number of employees	333,390	333,218	356,395	368,687	387,593	410,432	437,523	473,586	499,117	517,180		
Number of customers				46	51	55	60	73	72	85		
Customers per employee				34.54	32.94	25.29	20.77	21.98	30.74	33.41	21.51	
Economic growth rate(%)(at factor cost)	-4.8	2.9	4.2	-0.2	9.7	0.2	-1.2	-2.1	-5.4	-3.4	-4.8	
Population (Millions)	10.4	10.8	11.2	11.5	11.2	11.5	11.7	11.9	12.1	12.3		
Population growth rate(%)	2.6	2.4	2.5	2.2	2.1	2.7	1.7	1.7	1.7	1.7		
Annual revenue (US$)	279.182	305.683	234.13	265.24	303.475	331.664	260.337	230.876	403.865			
Debt collection days	85	99	61	50	56	32	25	32	38	30	45	

Source: Zimbabwe Socio-Economic Data AFREPREN/FWD 2003

Zambia

The Zambian power sector has three main participants namely ZESCO, CEC and LHPC. ZESCO Limited is the largest utility with a 100% state ownership involved in generation, transmission and distribution of electricity. Its main generation stations are Kafue Gorge (900 MW), Kariba North Bank (600 MW) and Victoria Falls (108 MW). The utility also owns several small hydro stations (23.75 MW) as well as several isolated diesel stations (10.3 MW). The Copperbelt Energy Company (CEC), is a private transmission company that supplies power to the Zambian copper mines. The company procures bulk power from ZESCO for distribution to the mines. It also has hydro and thermal power plants of a combined generation capacity of 80 MW. CEC owns 220kV transmission lines from Kitwe to Luano on the Copperbelt Province. The CEC transmission network forms the 220kV interconnection between Zambia and the Democratic Republic of Congo. CEC also owns some 66kV lines running to various mining areas within the Copperbelt although these are mainly treated as a distribution network to the mines. The Lunsenfwa Hydro Power Company (LHPC), a recently private generation company that sells its power to ZESCO Limited. It runs two small power stations with a total installed capacity of 38 MW on the Mulungushi River in Central Zambia.

ZESCO's National Control Centre (NCC) is responsible for system operation of the national grid. Apart from the National Control Centre, ZESCO also operates Regional Control Centres in the various regions of the country. CEC has its own control centre for transmission and distribution of power to the mines.

With the adoption of an energy policy in 1994, the Zambian energy sector has undergone a series of reforms. The most significant of these have been the following:

- Established the Energy Regulatory Board (ERB) through the Energy Regulation Act No. 16 of 1995;
- Repeal of the Electricity Act that abolished the monopoly of ZESCO as power sector participant hence opening the way for other players in the sector, and
- Establishment of an Office for Promoting Private Power Investment in generation and transmission projects.

During this time, the Government has been undertaking an economic restructuring programme supported by the World Bank and International Monetary Fund. One of the conditionalities for

external support to the Zambian economy has been the need for the Government to shed its shareholding in most sectors of the economy. Prior to 2002, the national electricity utility, ZESCO, had not been performing well. In 1998, for example, the company recorded an operating loss of K78 billion (US$17 million). The debtor days increased from 182 days in 1998 to 409 days in 2001. As part of the reform process, the national utility, ZESCO has also made strides in its commercialization programme. One of the noticeable improvements has increases revenue collection and reduction of losses.

The Zambian power sector is an integral part of the Southern African Power. SAPP is characterized by heavy reliance on hydropower in the north and on thermal power (coal generated) in the south. Like for all SAPP countries, Zambia's maximum demand patterns has been growing over the years (see Table 11)

The growth in the demand corresponds to the growth in Zambia's Growth Domestic Product (GDP) which, over the years, has been doubled from 2.4% in 1999 to about 5% in 2004.

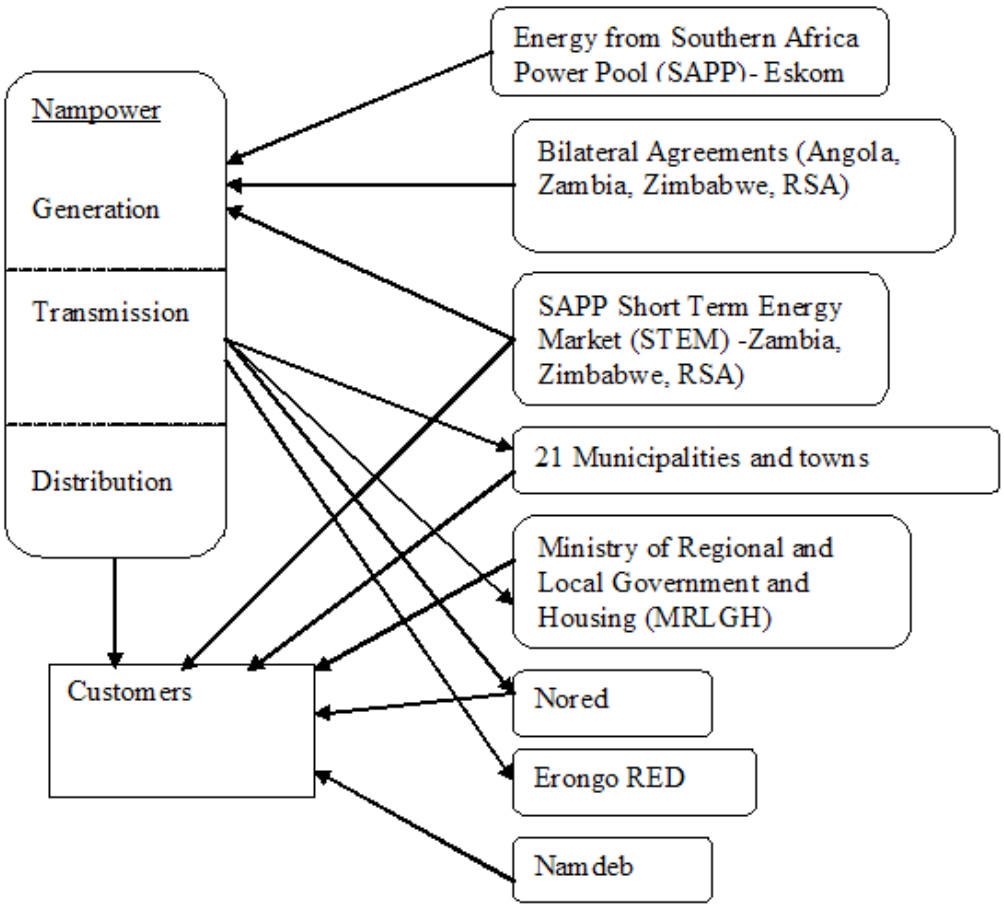
Table 11: Trends in the performance of the Zambian power sector

Year	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Electricity consumption per capita (MWh)	0.75	0.76	0.75	0.73	0.71	0.66	0.61	0.61	0.62	0.58	0.57	
Electrification levels												
* National		15	15	18	18	18	19	20	20	20	20	20
* Rural					2	2	2	2	2	2	2	2
* Urban					45	46	48	48	48	48	48	48
Installed Capacity (MW)	1,786	1,786	1,786	1,786	1,786	1,786	1,786	1,786	1,786	1,786	1,786	1,786
* Thermal capacity (%)	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
* Hydro capacity (%)	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5	99.5
Annual electricity generation (GWh)	6506	8060	8151	7924	7149	7941	7 604	7764	8 168	9 059	8 044	8 180
Max Electricity Demand (MW)									1,085	1,088	1.118	1,255
System losses	3.87%	3.24%	3.44%	2.83%	1.93%	2.06%	2.24%	2.90%	5.20%	3.94%	2.78%	2.30%
Number of customers					165,860	170,694	188,434	200,248	242,240	293,071	277,724	303,995
Population growth rates	2.30%	2.30%	2.30%	2.30%	2.30%	2.30%	2.30%	2.30%	2.30%	3.00%	3.00%	3.00%

Namibia

NamPower- Namibia's main power utility-is the only utility in Namibia that is engaged in generation and transmission services. It sources its power from a hydro power plant, thermal power plants, diesel generators and imports from neighbouring countries through bilateral agreements, and short term energy markets and the Southern African Power Pool. NamPower also sells power to other entities such as municipalities, large customers (Namdeb) and newly created regional distribution companies as seen in the following figure (Figure 12).

Figure 12: Structure of the Power Sector in Namibia



In Namibia, municipal electricity departments largely undertake distribution of electricity in their respective proclaimed towns which is a law under the Local Authorities Act (Act No. 23 of

1992). Distribution to rural areas of Namibia is the responsibility of the Ministry of Regional, Local Government and Housing (MRLGH). The distribution networks within towns, villages and rural settlements are owned by MRLGH on behalf of local authorities (except Oshakati, which is fully responsible for service within its jurisdiction).

The Ministry of Mines and Energy facilitates and regulates the development and sustainable utilisation of energy and mineral resources. The Electricity Control Board established in 2000 has the objective exercising control over the electricity supply industry and regulating the generation, transmission, distribution, use, import and export of electricity.

The reforms in Namibia started in earnest with the adoption of the 1998's White Paper on Energy Policy which required the Government to provide access to electricity to 25% of the rural population and 95% of the urban population by the year 2010 (White Paper on Energy Policy, 1998). The policy promotes the participation of the private investors and entrepreneurs in the distribution and supply of electricity and it recommended IPPs on the supply side.

Namibia adopted the Single Buyer Model on the recommendation by a study carried out by SADELEC which led to the transformation of NamPower into generation and transmission only company. The adoption of the single buyer model further liberalised the generation of electricity thereby opening the way for Independent Power Producers (IPPs) from whom NamPower now sources its supplies in addition to its own generation plants and imports.

Distribution of electricity is now left for the REDs (Regional Distribution Companies**)** which are the new entrants in the electricity distribution sector in Namibia. REDs are a result of a White Paper, which, amongst others, provides for the reorganization of the electricity distribution industry as a means of improving service delivery and efficiency in the electricity sector. A RED is a legal entity, which is tasked with the supply and distribution of electricity in a dedicated region, combining the electricity distribution departments of the Local Authorities, Regional Councils and NamPower.

The electrical energy consumption in Namibia has grown steadily over years, rising from 1,963 GWh in 1996 to 2,943 GWh in 2004. The average annual growth rate for the period 1992 to 2002 was 2.9%. However, with a stagnated installed capacity, an average system peak demand of 340

MW and demand increasing at the rate of 5% per annum, it is apparent that there is a serious power deficit in Namibia resulting in over reliance on imports.

Namibia dramatically reduced system losses from 14% in 1998 to the current 8%. This has been achieved through intensive investments in the infrastructure coupled with efficient revenue collection and billing systems. The bulk of the energy in Namibia is consumed by municipalities and the mining sector. However, there was an incredible 185% increase in electrical energy consumption in rural areas for the years between 1988 and 2001 compared to 13% in municipalities and 6% in mining which is attributed to the government's emphasis on rural electrification. The following table (Table 12) shows the trends in the performance of the Namibian power sector

Table 12: Trends of the power sector performance in Namibia

Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Annual electricity generation (GWh) (local generation)				1004	1198	1407	1211	1429	1421	1329
Electricity consumption per capita(kWh) based on energy sales	1279	1067	1050	1093	945	1050	1060	1104	1122	1373
Installed Capacity (MW)										
Total Installed Capacity	396	396	396	396	396	396	396	396	396	396
Hydro (%)	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9	62.9
Thermal (%)	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4	36.4
Others (%)	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
System Losses (%)				13.89	10.65	9.96	9.97	9.91	8.82	5.09
Total Electricity demand (GWh)		1963.3		1904	2085	2192	2277	2371	2466	2945
% of electricity demand met by supply***		55.52		63.39	42.54	36.27	46.82	39.73	42.38	45.13
Staffing Levels										
Number of employees				831	827	789	831	816	818	1566
Customers										
Number of customers (main Utility)				2541	2374	2219	2723	2894	3265	3261
Customers per employee (main utility)				3.1	2.9	2.8	3.3	3.5	4.0	2.1
Staff costs as a percentage of revenue (main utility)					20.49	20.31	22.73	26.25	28.05	30.74
Economic										

Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Economic growth rate(%)	4.1	3.2	4.5	3.3	3.4	3.5	2.4	3.3	3.7	
Population (Millions)	1.576	1.623	1.672	1.722	1.774	1.883	1.9343	1.975	2.001	2.035
Population growth rate(%)	2.98	3.02	2.99	3.02	3.00	2.74	2.74	2.10	1.50	1.50
Annual revenue (US$'000) (main utility)				96,324	87,058	77,958	67,528	46,296	66,145	79,874
Profit/Loss (US$'000) (main utility) after texation					31,610	19,258	19,652	13,391	11,370	9,027
Exchange Rate N$/US$	3.6271	4.2680	5.4855	5.4855	6.1125	6.8259	7.8802	11.4943	8.0451	6.6622
Tariff Cost:										
* Local currency	6.40	6.95	7.40	8.09	18.12	18.92	20.63	22.03	26.14	26.47
* US$	1.76	1.63	1.35	1.47	2.96	2.77	2.62	1.92	3.25	3.97
Taxes paid (US$'000)				12428	13534	10112	3158	-3806	3608	2496
Environmental										
Share of RETs of total electricity supply (including large hydro)							100	99.58	99.86	99.13
Share of RETs of total electricity supply (excluding large hydro)							0	0	0	0
Share of fossil fuels of total electricity supply							0	0.42	0.14	0.87

2.1.3 Status of the Power Sector in the Western Africa Region

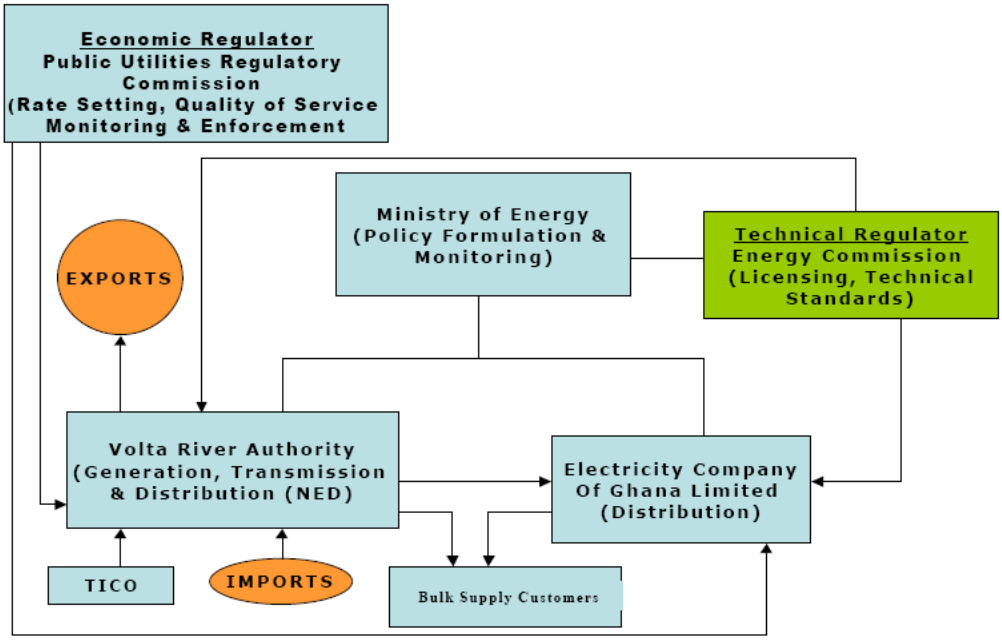
Ghana

The Ghana Power sector is dominated by the Volta River Authority (VRA). VRA is a state-owned entity established in 1961 under the Volta River Development Act (Act 46). It is responsible for generation and transmission of electricity in Ghana. Another electricity utility, the Electricity Company of Ghana (ECG) is a state-owned entity responsible for distribution of electricity to consumers in southern Ghana. There is also the Northern Electrification Department (NED) established in 1997, is a subsidiary of VRA responsible for power distribution in northern Ghana.

The Public Utilities Regulatory Commission (PURC) was established in 1997 to oversee the performance of the public utilities and is mandated to protect the interest of consumers (this has led to a certain difficulty in the case of increasing electricity tariffs, where PURC has had to deny utility companies their requested increases in the interest of consumers' ability to pay), and to examine and approve the rates chargeable by the utilities. The Energy Commission was also established in 1997 as an independent agency, with a mandate to license private and public entities that will operate in the electricity sector. The Energy Foundation (EF) was established in 1997 to promote sustainable development and efficient consumption of energy in Ghana. Ghana's electricity sector also has IPPs comprising of a mix of domestic or international entities that sell their electricity to VRA or ECG.

Energy Commission Energy Commission (EC) Act 541 1997 defined new structure for power market through the (EC) Act 541 1997 which defined new structure for power market allowing for private sector investment in power generation allowing for private sector investment in power generation and created "open access" transmission (EC) systems to provide non-discriminatory transmission services and enhance competition.

Figure 13: Structure of Power Sector in Ghana



The Ghana Power sector reforms were started in 1997 when the World Bank, in a policy shift, indicated that support would no longer be provided for electricity projects in developing countries unless there was a clear commitment by the Government in reforming the sector. The reforms were undertaken primarily to secure an IDA credit for the construction of the 330MW Aboadze plant, but there was also a view to secure private participation in the development of future electricity infrastructure.

The establishment of the two bodies, EC and PURC are the most prominent development in the power sector reforms. The Government of Ghana gave-in to the reform conditionality and demonstrated its commitment to reforming the sector by establishing a Power Sector Reform Committee (PSRC) in 1994 to work out the modalities, milestones, and time-tables for the reform process. By 2003, the ECA reviewed the progress in power sector reforms in Ghana and submitted the following findings:

Table 13: Progress of power sector reforms in Ghana

1997 Reform Proposal	Status as of 2003
Create 5 distribution concessions (DistCos), privatise	Not done
Large consumers. Rationalise and establish basis for bilateral contracts with IPPs	No progress; Energy Commission is considering new definitions for eligible consumers
VRA – unbundling into 4 main activities	Almost no progress. VRA has started some work on separating accounts
ECG set up a holding company for 5 DistCos	Not done
Establish separated activities as business units	Not done
Put in place performance contracts for ECG and VRA	Not done
Establish regulators and regulatory framework	2 regulators established with 2 Acts (Energy Commission and PURC). Limited development of regulatory framework (a few regulations issued)
Issue regulations and technical rules for the grid and creation of wholesale market	Not done.

Source ECA, 2003

The following table (Table 14) shows the shows the trends in the performance in Ghana's power sector.

Table 14: Trends in the performance of Ghana's power sector

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Electrification Levels (%):									
National	24.61%	27.09%	29.16%	31.76%	35.84%	39.20%	41.20%	43.32%	47.55%
Annual electricity generation (GWh)	6,133	6,627	6,886	5,013	5,924	7,223	7,859	7,296	6,462
Electricity consumption per capita (GWh)	6,077	6,658	7,342	5,437	6,804	7,835	8,030	8,028	5,860
Installed Capacity (MW) (VRA)									
Total Installed Capacity	1,102	1,102	1,212	1,322	1,432	1,678	1,704	1,715	1,726
Hydro (%)	97%	97%	88%	81%	75%	65%	66%	66%	66%
Thermal (%)	3%	3%	12%	19%	25%	35%	34%	34%	34%
Others (%)	0%	0%	0%	0%	0%	0%	0%	0%	0%
System Losses (%)	3.20%	2.80%	2.60%	2.30%	1.80%	2.80%	3.10%	4.40%	4.90%
Staffing Levels									
Number of employees (VRA)	2,614	2,616	2,647	2,724	2,842	2,902	3,038	3,138	
Number of employees (ECG)	3,011	3,164	3,374	3,613	3,808	4,026	4,166	4,146	4,484
Customers (ECG)									
Number of customers	466,720	527,980	585,342	647,872	744,005	832,593	893,880	969,674	1,093,494
Customers per employee	155	167	173	179	195	207	215	234	244
Staff costs as a percentage of revenue	8.0%	12.0%	14.4%	8.8%	7.8%	8.2%	6.3%	4.8%	6.1%
Economic	5.0%	5.0%	3.0%	3.0%	4.3%	3.0%	3.0%	5.8%	4.8%

Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
growth rate(%)									
Population (Millions)	16.7	17.1	17.6	18.0	18.5	19.0	19.6	20.0	20.1
Population growth rate(%)	2.6%	2.6%	2.6%	2.6%	2.6%	2.7%	2.6%	2.6%	2.6%
Financial									
Annual revenue (¢ '000,000) (VRA)	187,838	234,509	298,572	433,983	632,936	940,048	1,477,210	2,097,378	
Profit/Loss (¢ '000,000) (VRA)	73,991.14	92,807	61,243	18,698	79,203	(257,878)	(220,043)	(582,513)	391,105
Annual revenue (¢ '000,000) (ECG)	77,230	97,150	116,539	210,856	466,799	532,593	880,054.74	1,344,070	2,113,367.27
Profit/Loss (¢ '000,000) (ECG)	(5,491.32)	(26,227.52)	(33,980.22)	6,020.58	17,365.26	(13,629.47)	152,973.05	85,252.00	
Tariff Cost: (ECG)									
* Local currency	42.83	42.9	43.74	127.12	163.72	186			
Debt collection days (VRA)	131	152	161	194	205	204	163	195	
Ratio of current assets to current Liabilities*** (VRA)	1.87	2.57	1.38	1.17	1.15	0.77	0.90	0.73	
Debt collection days (ECG)	138	133	133	133	161	177	168	175	169
Ratio of current assets to current Liabilities*** (ECG)	1.31	1.05	0.88	1.09	0.94	0.80	0.88	0.93	1.08
Environmental									
Share of RETs of total electricity supply (including large hydro)	97%	97%	88%	81%	75%	65%	66%	66%	66%

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003
Share of RETs of total electricity supply (excluding large hydro)	0%	0%	0%	0%	0%	0%	0%	0%	0%
Share of fossil fuels of total electricity supply	0%	0%	0%	0%	0%	0%	0%	0%	0%

Burkina Faso

Until 1995, the energy sector was managed by the Ministry of Trade, Industry and Handicrafts in Burkina Faso. The ministry of Energy and Mines was later formed with the following objectives:

- The elaboration and application of laws and regulation of research activities, the production and distribution of electric products;
- The control of energy infrastructure;
- The promotion of sustainable energy systems.
- The control of the production, supply, and distribution of conventional energy.

During the formation of the Ministry of Energy and Mines (MEM), the Department of energy became the general department of energy (DGE). The responsibilities of the DGE were reinforced in order to ensure the development and the implementation of energy policies for all the sub-sectors including hydrocarbon, electricity, wood fuel and renewable energy. In order to widen the capacity of the MEM, the Ministry of Mines, Quarries and Energy (MCE) was formed in 2000.

SONABEL is the national power utility in Burkina Faso. However, under the decree N°2000-628/PRES/PM/M, the Government plans to privatise the national utility (SONABEL: Société Nationale Burkinabé de l'Electricité) and to design a new rural electrification strategy. Before the adoption of thie aforementioned decree. Parliament had adopted the first restructuring of the electricity sector under the 17 December 1998 law (No 060/98/AN) regarding the general regulation of Burkina Faso's electricity supply. The key new features of this law were:

i) to end the monopoly of the electricity generation in the whole country,
ii) the authorisation for electricity distribution in areas in which there are no companies dealing with the distribution business,
iii) the setting up a of fund for the electrification through of levy for each kWh sold in the whole country,
iv) the adoption by the parliament of a law authorising the government to privatise the utility,
v) the adoption by the Government of a decree in February 2003 setting up a fund for rural electrification and the Burkinabé agency for rural electrification,

vi) the adoption by the government of a decree in May 2004 dealing with the privatisation practicalities of the SONABEL.

It also specified that a private operator would be in-charge of the electricity production, transmission and distribution activities. However, the ownership of the assets would remain with the State. The new privatisation agenda should be completed by 2007.

The reform process in the electricity sector in Burkina Faso is still very young. The only significant reform that was done was the creation of new ministry in 2000 - the Ministry of Mines, Quarries and Energy (MCE) - charged with the definition and the implementation of the government energy policies. This was done with an aim to favour competition and attract private investors. However, SONABEL still remains unbundled and is in charge of generation, transmission and distribution.

The government has however formulated a Law No. 060/98/AN regarding the general regulation of the electric energy supply to Burkina Faso. This law aims at satisfying two objectives including the qualitative and quantitative security in energy supply while providing the reduction of production costs and eliminating the monopoly of the SONABEL. This is achieved by liberalization of electrictity production and distribution, hence opening up the sector for the private sector participation.

In-spite of the existence of a few projects such as regional solar programme (PRS) financed by the European Development Fund (FED), and the solar electrification project of community centres in about 150 districts funded by Spain, rural electrification is still a new concept in Burkina Faso. At the village level, a few small private initiatives were set up to distribute solar photovoltaic panels, establish community centres to recharge batteries, and also establish mini grids.

The total installed capacity in Burkina Faso is about 172MW while those of private independent producers (self producers) was estimated to 15 MW. Thermal power plants are estimated to be producing 75.3% of the capacity while four hydroelectric plants (Kompienga, Bagré, Tourni, Niofila) are producing 15.1% with the remaining share being produced from other sources. As seen in the following table (Table 15), it is apparent that other sources of generating electricity are getting into the power sector with a steady growth rate while Hydro power is steadily decreasing, a situation attributed to the environmental degradation.

The electrification levels in Burkina Faso is very low with an estimated electrification level of 9%. In rural areas, rural electrification is less than 1%, This situation is a big constraint for the socio-economic development of the country and the quality of life leading to significant rural-urban migration.

Table 15: Trends in the performance of Burkina Faso's power sector

Year	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Annual electricity generation (GWh)		201	215	216	242.8	273.5	306.1	338.1	359.9	390	365	364.6	444
Total Installed Capacity		78	102.82	102.77	106.26	108.33	110.53	127.47	147.16	162.12	162	171	
Hydro (%)		8.7	19.3	30.3	35.2	24.7	18.66	21.5	33.33	24	11.8	15.1	
Thermal (%)		91.3	80.7	69.7	64.8	75.3	81.33	78.5	66.66	76	73.5	75.3	
Others (%)		0	0	0	0	0	0	0	0	0	14.7	29.6	
System Losses (%)		12.9	14.4	12.3	14.6	17.5	14.3	17	14.8	15.2	17.3	15.5	17
Total Electricity demand (GWh)		175	184	189.4	207.4	225.7	259.2	280	306.5	330.9	356.3	401.7	427.3
Staffing Levels													
Number of employees		1268	1300	1293	1292	1271	1249	1309	1335	1325	1375	1399	1452
Number of laid-off workers***			982	972	960	938	912	964	974	938			
New jobs created***			100	138	128	56	68						
Customers													
Number of customers		69767	85092	96165	113892	122814	136238	151126	163068	163577	191677	204170	226691
Customers per employee		55.021	65.455	74.374	88.152	96.628	109.08	115.45	122.15	123.45	139.4	145.94	156.12
Economic growth							-4.54			-3.281	5.263	10	31.818

Year	**1991**	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
rate(%)													
Population (Millions)	9.1962	9.4094	9.6275	9.8507	10.079	10.313	10.558	10.809	11.065	11.328	11.598	11.873	12.155
Population growth rate(%)	0.013	0.0227	0.0227	0.0227	0.0227	0.0227	0.0232	0.0232	0.0232	0.0232	0.0232	0.0232	0.0232

Côte d'Ivoire

Energie Electrique de Côte.d'Ivoire (EECI)**,** the main electricity utility in Cote d'Ivoire was established in 1952 as with the aim of ensuring electricity production, transmission and distribution in the country.

The power sector in Cote d'ivoire is made up of the following actors:

- ANARE (Autorité Nationale of Regulation of the Sector of Electricity), that has the role of following-up the observance of the regulation and conventions, the arbitration of the conflicts between the actors of the sector and the protection of the interests of the consumer.
- SOGEPE,(Trust company of the Inheritance of the Sector of Electricity) has the role of managing the assets of the State and also ensures accountability and financial management of all investments of the State in the sector.
- SOPIE, (Société of Operation Of the Ivory Coast of Electricity) is in charge of the management of the transmission and distribution of the of energy exerted by the Co (Company of the Ivory Coast Electricité), and planning investment projects for electricity production, transmission and distribution, and the coordination of project implementation.
- Co, a private actor, is the concessionary operator of the public utility (the Dealer) for a period of 15 years as from October 25, 1990.
- CIPREL (Company Of the Ivory Coast of Production of Electricity) and AZITO ENERGY (ex-CINERGY), are the existing IPPs in the sector working under contracts of BOOT type.
- The fuel suppliers OCEAN ENERGY, FOXTROT (ex-APACHE) and CNR (ex-To arrange OIL Ci) are private actors charged with the exploration and installing gas pipelines, to feed the power stations.

Electricity sector reforms started in Ernest in 1990, when the financial mismanagement of EECI nearly bankrupted the company. The Government created the privately-held company (Compagnie Ivoirienne d'Electricité, CIE) to generate, transmit, distribute, import and export electricity in the country. ECCI's role was therefore relegated to owning the underlying assets of CIE and management of the power sector. CIE signed a leasing agreement later that year and it started its operations immediately. The creation of the private company, CIE led to an apparent

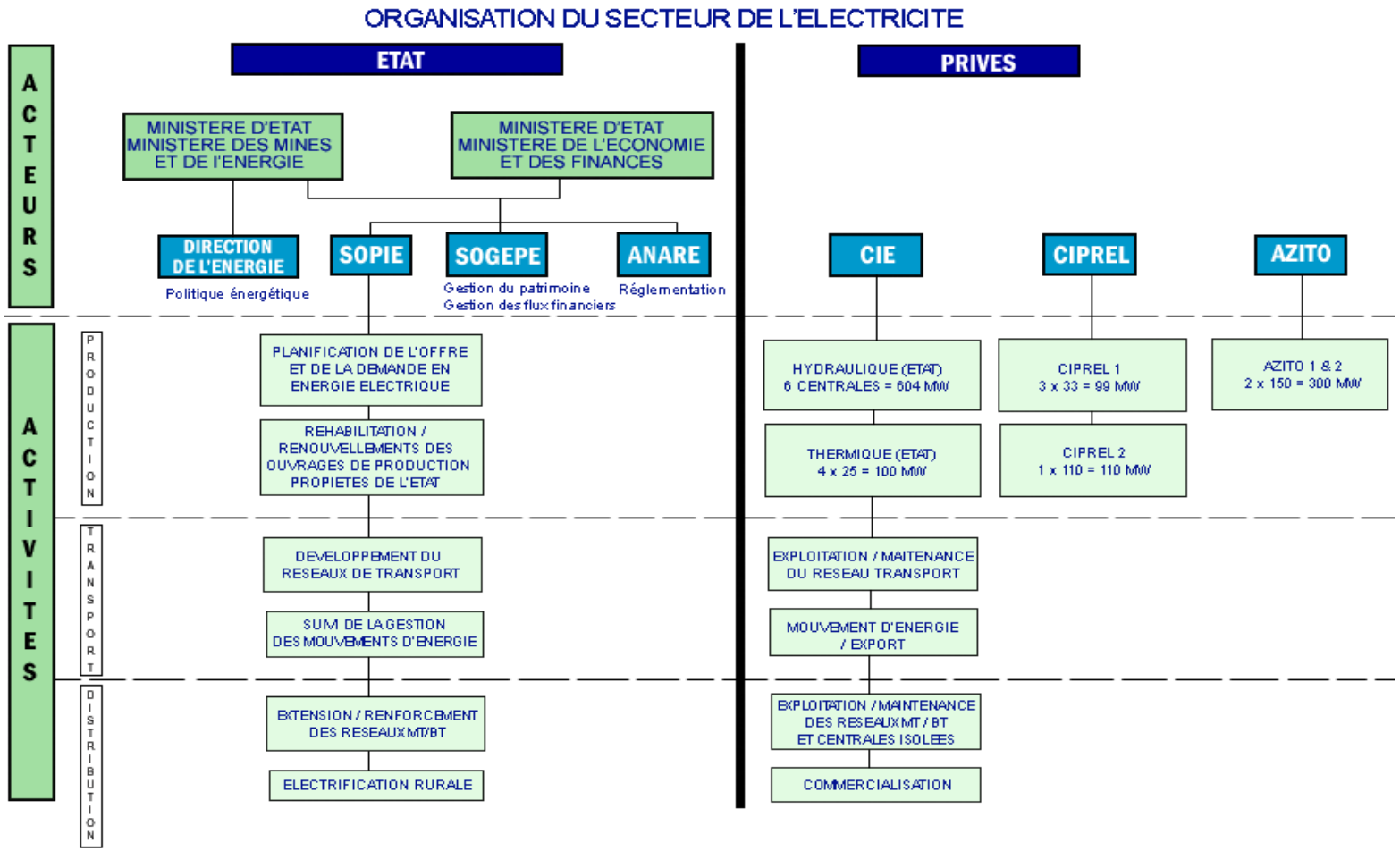
turnaround in the performance of the electricity sector. In its first year of operation, CIE recorded a net profit of over 800 million FCFA, compared annual losses for the EECI during the whole decade. The apparent and highly visible successes of the electricity privatisation provided a further impetus to the government to deregulate the economy, devalue the currency and privatise the telecommunication and agro-industry sectors.

The Government further created the Melt National for the Electric Power (FNEE) in 1994 to ensure the financial management of the sector of electricity. It is during this year that first IPP of electricity, the private company, Company of the Ivory Coast of Production of Electricity (CIPREL) entered the sector. In 1998, the Government took further reform measures by reorganization the electricity sector. Some of the measure taken by the Government include:

- Liquidating EECI,
- Dissolving the FNEE,
- Creation of three (3) new State institution: The National Electricity Regulatory Authority (ANARE) ; Trust company of the Inheritance of the Electricity Sector (SOGEPE) and Company for Operations in the Sector of Ivory Coast (SOPIE) .

Ivory Coast has an effective installed capacity of 1,202 MW including 604 MW for the six (6) hydroelectric factories and 598 MW for the power stations functioning with natural gas of the Ivory Coast. About 510 MW of effective installed capacity comes from the private sector.

Figure14 : Structure of the Power Sector in Ivory Coast



Source: www.sopie.ci, SOPIE, 2005.

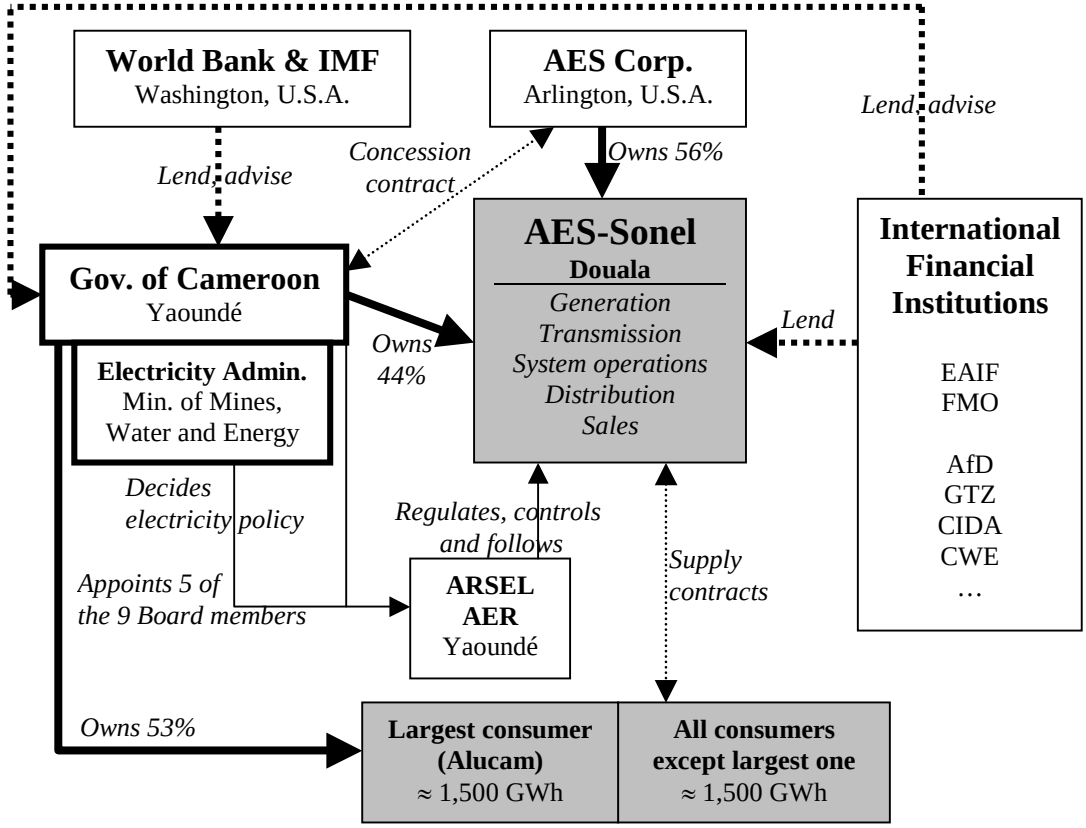
Cameroon

Despite a legislative overhaul made in 1998 to introduce competition and there after privatization in 2001, the Cameroonian power sector is structured as a regulated private monopoly. The vertically integrated company, AES-Sonel, is responsible for generation, transmission, distribution, system operations and sales. It is regulated by an electricity regulatory agency (ARSEL, standing for "Agence de régulation du secteur de l'électricité") under a 20-year "main concession agreement". The main concession agreement contains sub-sector specific concession agreements and licenses (for transmission, distribution, system operations and retail sales).

The complexity of the Cameroonian power sector, beyond the relatively simple appearance of a regulated private monopoly, comes from two sources. First, the legal framework was not created for an integrated monopoly. It was rather developed for an unbundled power sector, with different companies holding concession contracts in different sub-sectors. Secondly, the gap between what institutions have to do in theory and what they can do in practice is significant. The real distribution of power among power sector players does not reflect what is intended in the legislature.

Consequently, the structure of the power sector, instead of mostly consisting of a private monopoly and its regulator, is a mix of multiple national and international players.

Figure 15: Institutional Structure of the Power Sector in Cameroon

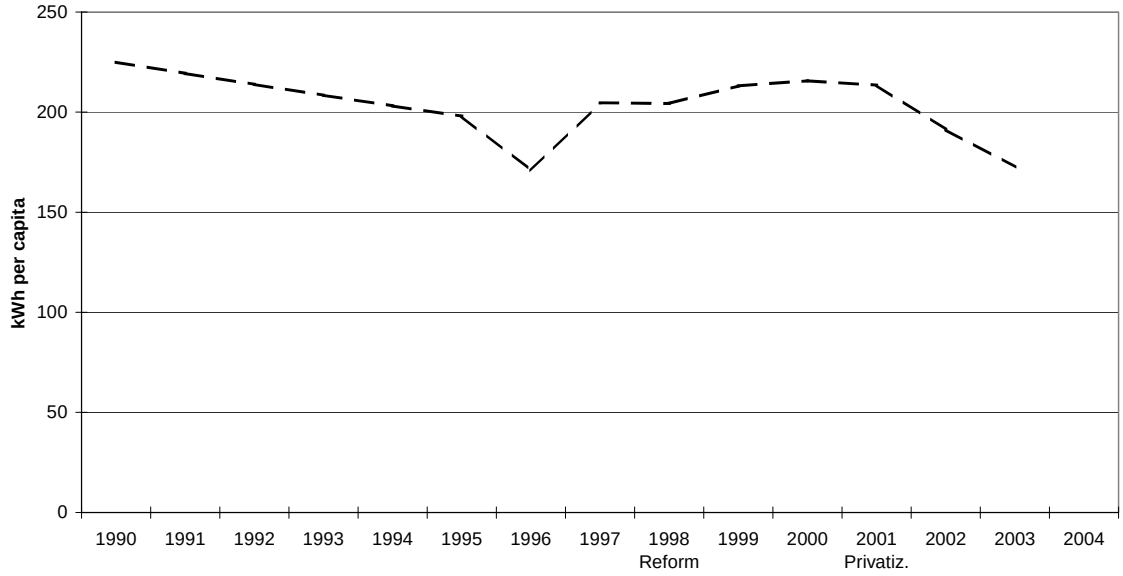


Since the creation of Sonel in 1974 and until the 1998 reform, the power sector was the responsibility of various ministries (Lavalin International, 1990:90). The electricity policy was the responsibility of the Ministry of Mines, Water and Energy, prices were set by the Ministry of Industrial Development and Commerce, funding was secured through the Ministry of Finance and the accounting for state-owned enterprises was done by the Ministry of Public Service. This complex structure was prone to various inefficiencies and even contradictory policies. No consistent, integrated legislative framework existed and legal texts were not applicable.

After the 1998 Electricity Act, two decrees were passed in 1999 to set up the electricity regulatory agency and the rural electrification agency. In 2000, a decree governing the activities of the electricity sector was enacted and privatization eventually occurred in 2001.

Electricity consumption per capita in Cameroon has been about 200 kWh per year for the last fifteen years, with a tendency to decrease rather than increase, as Figure 16 illustrates.

Figure 16: Electricity Consumption Per Capita in Cameroon



Three different problems explain the stagnation or even decrease of per capita consumption in Cameroon in the last fifteen years:

i. the poor maintenance of existing electric equipment;

ii. the lack of investment in new capacity to supply the growth of demand due to economic and demographic growth; and

iii. variations in hydraulicity. Severe droughts are indeed largely responsible for the decrease in per capita consumption after 2001.

Since the privatization in 2001, electricity supply quality has deteriorated significantly in Cameroon. Long blackouts have been usual between 2001 and 2005, firms have incurred important losses and citizens have demonstrated their anger in the streets. A situation that is attributed to (i) exceptionally "dry" years, limiting the availability of water to generate electricity; and (ii) concession contract specifications. Table 16 provides the performance of the power sector in Cameroon before and after reforms.

Table 16:Trends in the performance of the power sector in Cameroon

Year	1995	1996	1997	1998	1999	2000	2001 Privatization	2002	2003	2004
Annual electricity generation (GWh)	2,804	2,922	3,146	3,172	3,391	3,501	3,535	3,249	2,988	3,700
Electricity consumption per capita (kWh)	198	170.8	204.63	204.31	213.08	215.62	213.48	191.26	172.59	
Total Installed Capacity	627	820	820	817	817	819	897	902	902	987
Hydro (%)	84.53	88.17	88.17	88.49	88.49	88.52	89.52	89.58	89.58	
Thermal (%)	15.47	11.83	11.83	11.51	11.51	11.48	10.48	10.42	10.42	
Total Electricity demand (GWh)	2,608	2,717	2,926	2,950	3,154	3,256	3,288	3,022	2,779	
Number of employees	3,795	3,802	3,751	3,751	3,823		3,802			3,443
Customers										
Number of customers		420,995	428,269	447,936	452,192	452,994	452,000	452,000	505,300	505,300
Customers per employee		110.73	114.175	119.418	118.282		118.885			146.762
Economic growth rate(%)					4.39	4.2	5.3	4.2	4.7	
Population (Millions)	13.277		14.298	14.439	14.8	15.1	15.4	15.8	16.1	
Population growth rate(%)					2.31	2.23	2.15	2.07	2	
Financial										
Annual revenue (US$ millions)	117	120	109	191	191			147	203	284
Profit/Loss (US$ millions)							-4.5	13	20	43
Environmental										
Share of RETs of total electricity supply (including large hydro)	97.18%	97.16%	97.30%	97.26%	97.35%	97.34%	97.28%	96.94%	96.57%	
Share of RETs of total electricity supply (excluding large hydro)	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%	
Share of fossil fuels of total electricity supply	2.82%	2.84%	2.70%	2.74%	2.65%	2.66%	2.72%	3.06%	3.43%	

Senegal

Created in 1998, SENELEC (Société d'Electricité du Sénégal) is the main producer and supplier of energy in Senegal. The company is responsible for the generation transmission, distribution and supply of electricity throughout the country. The Senegalese government now has a 41 % share in the company after a consortium of foreign companies (Hydro-Quebec of Canada and Elyo of France) acquired a 34 % interest in 1999. 10 % of the company's shares have been set aside for company employees while the remaining 15 % are available to the public on the regional stock exchange, the Bourse Regionale des Valeurs Mobilieres (BRVM).

The sources of electricity for SENELEC include generation (396 MW in 2003) and purchase of electricity from IPPs (e.g. GTI, Manantali). It holds the monopoly of electricity transmission in the whole country except for the inter-connected network of Manantali and also holds the monopoly of distribution.

GTI (Greenwich Harnesses Inc.) - Dakar, a subsidiary of General Electric-Capital, is a private independent producer. In 1996 it signed an exclusive electricity supply agreement with SENELEC for a period of 15 years. It runs a combined cycle power plant of an installed capacity of about 52 MW, brought into service into 1998/1999.

Eskom-Energy-Manantali (EEM), a subsidiary of Eskom South Africa, signed a contract with the Company of Energy management of Manantali (SOGEM), for the development and management of the electrical works of the Organization of Development of the River Senegal (OMVS).

The reform process in the electricity sector in Senegal started in Ernest in 1997 with a drive to attract the private investments and to introduce competition into the sector. SENELEC underwent a re-privatisation of 51 % in 2001, following a recurrence of the power failures experienced prior to privatisation. The Hydro-Quebec-Elyo consortium had been managing the company for 18 months at the time the international tender for re-privatisation was offered. The government has estimated that a further 170 MW of thermal capacity will be required in the coming years at a cost of US$ 200 million. Private power companies are to be allowed to develop the majority of these projects. Senegal hopes to invest US$ 152 million in the power sector up to 2015 to make up deficits and reduce power cuts especially to the capital, Dakar.

Generation of electricity has been liberalised and IPPs are allowed to generate electricity on the basis of contracts of the "BOO" . Electricity transmission on the other hand is still monopolised by SENELEC for unspecified duration for the whole country except for areas within the framework of the international projects (e.g. OMVS, OMVG) . SENELEC has an exclusive geographic perimeter of distribution given under concession contracts. The Government, however, plans to open up

transmission to private operators through concessions to encourage competition and increase the level of installed capacity.

During the last fifteen years, SENELEC's electricity production and sales have seen a annual growth rates at an average of 5.5 % and 5.7 % respectively. In fact, during the period 1990 - 2004, produced energy grew from 902 GWh to 1,952 GWh, and the sold energy grew from 721.8 GWh to 1536.1 GWh.

Since the implementation of the reform of the sector of electricity in 1999, consumption of electricity has had an annual average growth of 10.4 % between 1999 and 2001 and 7.6 % between 1999 and 2004. During the period after reforms, the national rate of electrification has grown by 5.3 % (reaching 36.7% in 2004), against 3.0 % during the time 1990-1998; and for this same period the rate of rural electrification realised a growth rate of 14.3 % (reaching 12.5 % in 2004), against 11.5 % during the time 1990-1998. This is due, on one hand to the Government's rural electrification programmes and on the other hand, it is attributed to the projects carried out by SENELEC within the framework of its obligations of electrification as defined as a conditions in the concession.

Table 17: Trends in the performance of the power sector in Senegal

Year	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**	**2004**
Electrification Levels (%):										
- National	26.3	25.8	26.6	26.9	28.3	29.8	31.4	33.2	34.6	36.7
- Urban	51.3	49.5	50.1	50.0	51.3	52.6	55.4	56.6	58.5	59.5
- Rural	4.1	4.4	4.9	5.3	6.4	7.6	7.5	9.6	9.9	12.5
Annual electricity generation (GWh)	1085.5	1155.9	1243.5	1304.3	1348	1476.3	1651.3	1724.4	1826.5	1952.1
Electricity consumption per capita (kWh/capita)	105.9	107.6	114.2	118.9	114.6	120.6	132.5	134.7	140.5	145.6
Installed Capacity (MW)										
Total Installed Capacity (MW)	295.1	295.1	313.2	341.5	408.5	422.3	422.3	470.0	500.0	496.3
System Losses (%)	18.57	20.20	19.12	17.62	21.11	22.16	21.55	21.61	20.89	21.31
Total Electricity demand (GWh)	883.9	922.4	1005.8	1074.4	1063.4	1149.2	1295.4	1351.7	1444.9	1536.1
% of electricity	98.87	99.54	97.94	96.81	95.56	97.74	98.46	98.73	99.52	99.11

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
demand met by supply***										
Number of unplanned shortages***						6422	3934	5316	2626	1595
Staffing Levels										
Number of employees	2228	2184	2163	1759	1730	1726	1756	1723	1855	2083
Customers										
Number of customers	305673	311853	329814	343853	369108	398533	431432	469995	502847	551102
Staff costs as a percentage of revenue (%)	16.3	18.4	16.8	14.9	14.1	15.0	13.8	12.9	13.8	14.7
Economic										
Economic growth rate(%)	11.4	7.9	7.6	9.1	12.9	3.5	5.6	8.0	6.9	8.3
Population (Millions)	8.348	8.5732	8.8038	9.0397	9.2808	9.5266	9.7773	10.032	10.287	10.548
Population growth rate(%)	2.70	2.70	2.69	2.68	2.67	2.65	2.63	2.60	2.54	2.54
Financial										
Annual revenue (Millions FCFA)	63896	66258	72560	77649	78430	85154	94950	108146	119128	124634
Tariff Cost:										
* Local currency (FCFA/kWh)	72.3	71.8	72.1	72.3	73.8	74.1	73.3	80.0	82.4	81.1
Taxes paid (Millions FCFA)	1232	940	8697	2090	2782	3763	3080	3697	3413	4057
Debt collection days (Recouvrement créances clients)	203	78	69	67	127	125	139	132	121	99
Ratio of current assets to current Liabilities***	1.02	1.07	1.09	1.14	1.11	0.98	1.51	1.36	1.55	1.26
Environmental										
Share of RETs of total electricity supply (including large hydro)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	12.8	12.0	12.1
Share of RETs of total electricity supply (excluding large	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

Year	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004
hydro)										
Share of fossil fuels of total electricity supply	100.0	100.0	100.0	100.0	100.0	100.0	100.0	87.2	88.0	87.9

Mali

Energie du Mali (EDM) – the main energy utility in Mali - was created in the form of an industrial and commercial company – in which the Malian Government held 97.2% of the capital, with Electricité du France (EDF) holding the remaining 2.8%. EDM has undergone three phases in its reform process namely: (i) EDM as a mixed investment company; (ii) EDM in the period of temporary total delegation of management; and (iii) EDM as a limited private company.

The reform process in the electricity sector in Mali is attributed to the need by the Malian Government's to provide electricity and water supply for the vast majority of the country's population, under the best possible conditions, in terms of quality and cost. The Malian Government set the following objectives as means of achieving its goals:

- Improvement of the sector's efficiency and productivity by disengaging itself in the running of the electricity industry; providing of potable water;
- allowing the participation of the private sector in the power sector. The government therefore planned to open up the electricity and water sectors to competition; privatise EDM;
- restructuring the electricity and water sectors and executing a rural electrification programme.

During the period of temporary total delegation of management, the Government of Mali committed EDM to a process of reform to overcome the difficulties of management and operation of the EDM. The first phase of this reform was the total delegation of management of EDM; this began in 1995 and lasted for a period of 4 years with a possibility for extension to a maximum of five years. The Malian Government transferred decision-making power to the professional partner body. This phase of total delegation of management ended in 1998, with mixed investment company management system continuing until 1999. During this stage, the process of privatising EDM began in earnest.

The state-owned electricity companies or national utilities in Mali have been facing several difficulties including: poor management; lack of investment in the sector; poor quality of services, etc. This situation has impacted negatively to the development of the economy and the living standards of a majority of the population. As a result, the Government have embarked on a review of their energy policy and/or strategy, which includes electricity reforms implemented after 1998. However, in spite of these reforms, the rate of electrification remains low. The urban poor and the rural populations remain marginalized.

Mali's total electricity consumption remains far below the required level for sustainable economic growth. Over an entire decade, national consumption has only doubled but remained low, rising from 176.34 GWh in 1990 to 349.04 GWh in 2000. This low consumption is partially due to the country's low industrial base. Per capita electricity consumption has crept up between 1990 and 1995. It went up from 21.7 kWh per capita in 1990 to 34 kWh per capita in 2000, i.e. an average annual increase of 5.6%. During the period prior to the reforms, per capita consumption stood at 37.1 kWh in 2001, then reached 40.3 in 2002, reflected an increase of 8.6%.

The post-reform period is marked by a sharp increase in the proportion of the population that has access to electricity mainly in the urban areas. The electrification level rose by 3%, from 9% in 1999 to 12% in 2002. The increase in electrification in 2001 and 2002 can be attributed to promotional connection offers in both the water and electricity networks, which encouraged many households in urban areas to connect.

Niger

The electricity sector in Niger is dominated by the Niger Electricity Company (NIGELEC) which is a Government owned utility responsible for generation, distribution and transmission of electricity in the country. NIGELEC also sources electricity mainly from coal fired power station, purchases from SONICHAR and imports from Nigeria. SONICHAR operate a coal fired power station of 32 MW which supplies NIGELEC and the Uranium mining companies located in the extreme North of the country .

Supply of electricity in Niger is therefore assured through three distinct sources:

- Local production NIGELEC, uninterrupted in the isolates centres and in help in the centres inter-connected with the network from Nigeria,
- SONICHAR production, which supplies in part of 90% Uranium mining companies and 10% NIGELEC,
- Interconnections with the networks of Nigeria which ensure approximately 85% of the national electric demand.

The reform process in Niger was fuelled by the World Bank/International Monetary Fund which required the Government to implement Structural Adjustment Programme of which the electric sector was included. The Government is in the process of privatising the National Electricity Utility (NIGELEC) which is currently identifying a strategic operator.

The enactment of the Electricity Law (Law N° 2003-004" of January 31 2003), provided for the delegation of the public utility in generation, transmission and distribution of the electricity power on a purely exclusive basis with a private strategic operator. It also liberalised the sector and opened it up to IPPs.

Some of the electricity sector reform steps that the country has implemented include:

- The adoption of the document of sectoral policy in the field of electricity
- The adoption of the Ordinance carrying creation, organization and operation of the Authority of Multi-sector Regulation and
- The adoption of the Law carrying Code of the Electricity and its decree of application

The Government has also implemented a rural electrification programme started in 2001 through NIGELEC in which a tax of 2F is charged for every KWh and this money is directed towards increasing the grid network in the rural areas. The Government however plans to create an autonomous agency of rural electrification which will among other functions, subsidize investments from a national fund of rural electrification.

Ministry of Mining and Energy (MME) is in charge of the policies in the electricity sector. A regulatory Authority - Multisectoral Regulation Authority (MRA) works with the MME for the regulation of the electricity sector. MRA has the objectives:

- Applying the legislature governing the sectors under objective, transparent and no-discriminatory conditions;
- Protecting the interests from the users and the operators, by taking any measurement suitable to guarantee the exercise of a healthy and fair competition in the sector;
- Promoting the effective development of the sector while paying attention to, in particular, the financial and economic equilibrium and safeguarding the economic conditions necessary for to its viability,
- Implementing the mechanisms of consultations of the users and the operators envisaged by the laws.

The following table (Table 18) shows the trends in the performance of the power sector in Niger.

Table 18: Trends in the Performance of the power sector in Niger.

Year	**1992**	**1993**	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**	**2000**	**2001**	**2002**	**2003**
Installed Capacity (MW)	98.80	98.81	98.82	98.83	98.83	98.83	98.83	98.83	98.83	98.96	102.96	103.36
* Thermal capacity (%)	100	100	100	100	100	100	100	100	100	100	100	100
* Hydro capacity (%)	0	0	0	0	0	0	0	0	0	0	0	0
* Other (%)	0	0	0	0	0	0	0	0	0	0	0	0
Useable capacity (MW)	95	95	95	96	96	96	96	96	96	96	98	99
Electricity generated (GWh)	169.4	177.3	175	166.8	169.81	186.33	185.8	170.19	204.77	180.18	184.28	191.47
Electricity supplied (GWh)	329.8	342.8	346.9	361.75	369.1	395.7	411.4	402.5	408.59	424.18	444.54	466.1
Electricity purchased from outside suppliers (GWh) (if any)	160.4	165.5	171.9	194.95	199.31	209.41	225.64	232.35	203.82	244	260.3	274.6
Electricity access rate:												
* Overall (% of total population)	3.87	4.1	4.3	4.56	4.7	4.78	4.9	5.1	5.4	5.55	6.3	6.49
* Rural (% of rural population)	0	0	0	0	0	0	0	0	0	0.1	0.4	0.5
* Urban (% of urban population)	23	24	25	26	26	26	29	30	34	38	41	43
Number of customers:												
* Overall	43.720	45.048	49.045	51.403	57.468	63.535	68.409	73.721	80.295	90.066	98.707	107.15
* 'Industrial' (HV)			73	78	78	87	91	93	107	138	143	147
* 'Commercial' (MV)			576	571	573	573	581	579	542	494	495	553
* 'Residential' (LV)			48.396	50.817	56.817	62.875	67.737	73.049	79.646	89.434	98.069	106.45

Year	1992	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003
Total staffing levels at the utility (including contractors)	1213	1208	1155	1122	1136	1100	1141	1107	1104	1074	1047	

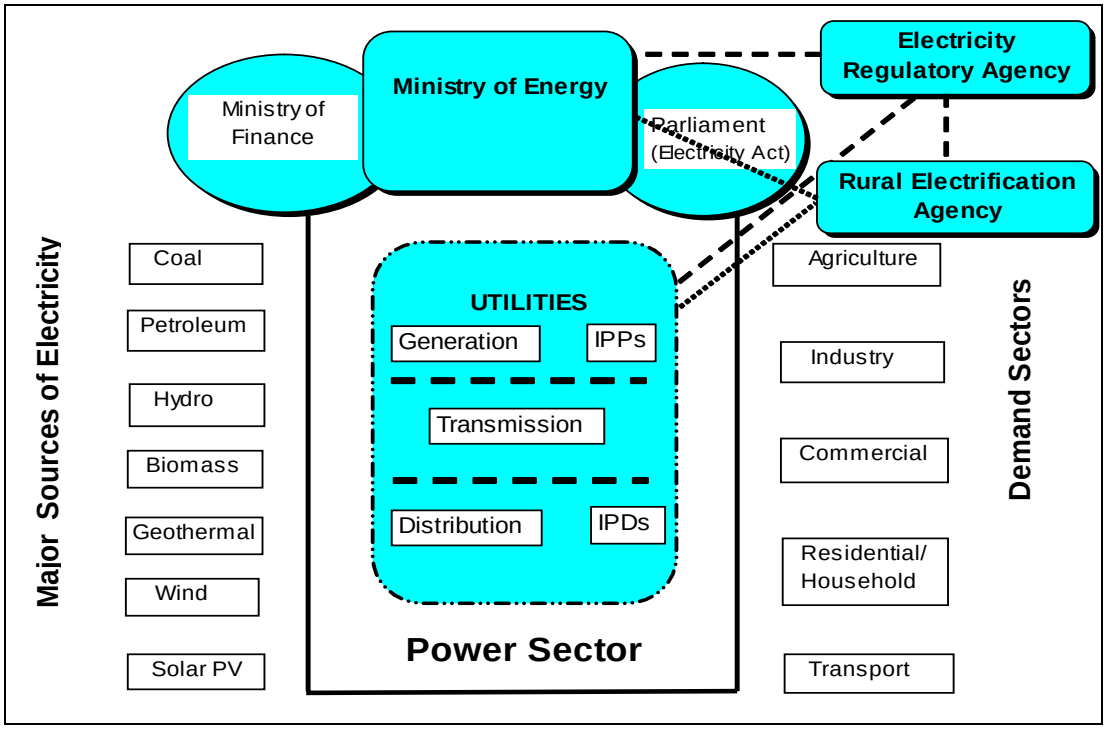
2.2 Performance of the Power Sector

The performance of the power sector in the sub-Saharan African region varies widely depending on the level of economic development of a particular country, political conditions as well as the approach used to reform the electricity industry. This section provides a detailed assessment of the performance of the power sector in the region based on the findings of the country studies. The performance of the power sector can broadly be categorized into two: (i) Technical performance – taking into account indicators of utilities' technical & management operations; and, (ii) Financial performance.

2.2.1 Institutional Structure of the African Power Sector

Figure 17 illustrates the typical institutional structure of the power sector prevailing in most of the countries covered in the study.

Figure 17: Typical Institutional Structure of the Power Sector



Key:

IPPs = Independent Power Producers

IPDs = Independent Power Distributors

Source: Compiled by authors

The institutional structure shown in the previous graph above depicts an idealized reformed power sector. Prior to power sector reforms, the Electricity Regulatory Agency, IPPs and IPDs were non-existent. With the on-going reforms, IPPs and IPDs appear in the institutional framework alongside the state-owned utility at generation and distribution levels. In addition, the Electricity Regulatory Agencies have been established as independent bodies with "arms-length" relationships with the Ministry of Energy as well as the state-owned and private utilities.

Another important development is the establishment of Rural Electrification Agencies whose responsibility is to enhance access to electricity among the rural population through investments in electricity transmission and distribution infrastructure and in some cases subsidising capital investment in rural electricity generation. While only a handful of Rural Electrification Agencies have been established these are likely to increase as more countries continue to reform their electricity industries.

Power sector reforms have transformed the Parliament into a crucial institution in the sector due to its mandate of formulating and amending the Electricity Act that governs the power sector. The Ministry of Energy[8] has continued playing a significant role in the reformed power sector by ensuring that the policies are in line with the overall objectives of power sector reforms. The Ministry of Finance is also an important institution in the framework playing the role of making key financing and investment decisions within the power sector.

As shown in the Figure 17, there are seven (7) major sources of electricity supplying electricity to the main demand sectors. However, the core source of electricity in the countries covered in this study hydro. This is in contrast to North African countries which depend on petroleum-based electricity generation and South Africa which relies on coal in addition to hydro and fossil fuel power plants. In most of Sub Saharan African countries, biomass in form of bagasse is used for co-generation in sugar industries. A few countries such as Kenya have a limited number of wind-turbines for power generation. Kenya is also the only country to commercially exploit geothermal for electricity generation. Solar PV systems are mainly used in rural areas to meet small electrical loads such as lighting, radio and television.

[8] *For some countries in Africa, the Ministries in charge of the energy sector may not always be the Ministry of Energy. Others could be: - Ministry of Natural resources or Ministry of Mines and Energy.*

The major electricity demand sectors are industry, commerce and households. Use of electricity for transport is largely limited to electric trains in parts of southern and northern Africa. In agriculture, some electricity is used in large farms as well as in agro-industries.

2.2.2 Technical Performance

The following table summarizes the technical performance of the power sector in the respective countries covered in this study.

Table 19: Key Economic and Electricity Industry Indicators (2003/2004)

	Population Growth Rates (%)	Reported Economic growth Rate	Electricity Consumption per Capita	Installed Capacity	Annual Electricity Generation	System Losses (%)	Number of Customers	Number of Employees	Customers per Employee	Electricty Access Levels
Countries										
Burkina Faso	0.02	3.9	19	*172	444	17	226,691	1,452	156	9
Zambia	3.00	2.9	537	1,786	8,180	2	303,995	**3,963	77	20
Eritrea	3.00	4.0	58	176	273	17	113,103	1,031	110	34
Namibia	1.50	3.7	1,373	396	1,329	9	3,261	1,566	2	**40
Cameroon	2.00	4.7	173	987	3,700	*35	505,300	3,443	244	46
Zimbabwe	**1.7	-4.8	880	1,961	11,972	**15	**517,180	6,000	**86	**84
Senegal	2.54	8.3	146	496	1,952	21	555,102	2,083	266	37
Tanzania	2.80	6.5	93	911	3,393	25	550,863	4,857	113	9
Ghana	2.60	4.8	291	1,726	6,462	5	1,093,494	7,622	143	48
Kenya	2.75	4.3	126	1,229	5,035	19	686,195	6,216	110	9.1
Mali	2.9	4	*40	**186	**590		**90,989			*12
Niger	3.6	3.5	28	103	191		107,150	1,047	102	6.4
Cote d'Ivoire	2.1	-1	172	1,202	4,075		750,000			71
Uganda	3.2	5	44	303	1,760	28	244,245	1,429	171	5

Note:

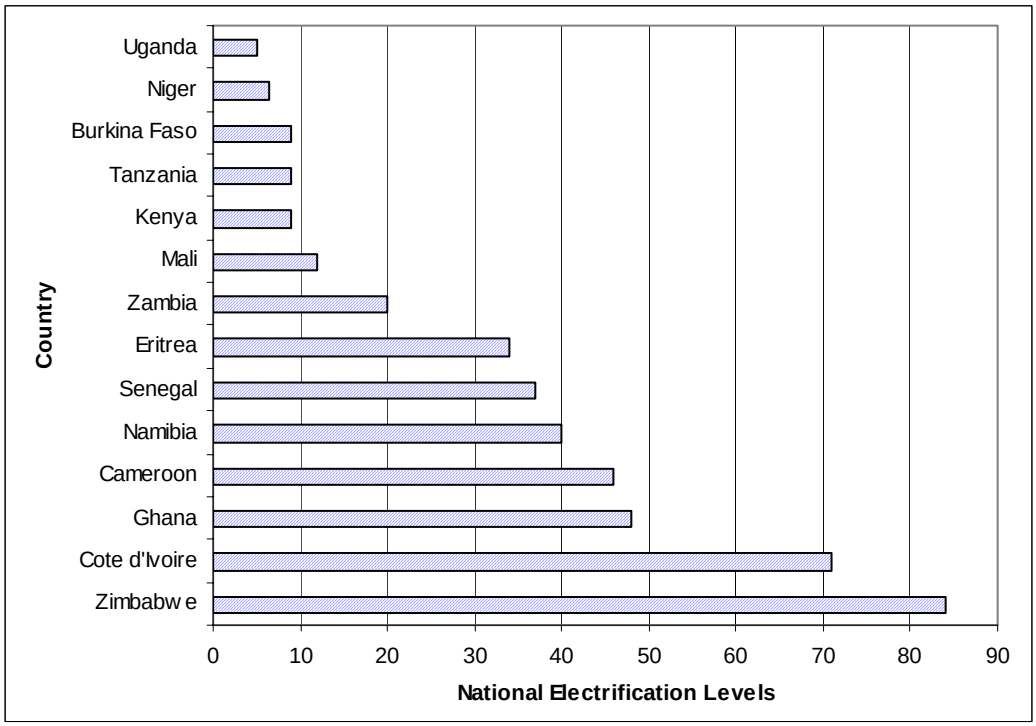
* 2002 data

** 2001 data

Electrification Levels

National electrification levels in the countries covered in the survey are low with most countries registering levels below 30%, with the exception of Cote d'Ivoire, Ghana, Namibia, Senegal and Eritrea. This is a very low figure, compared to northern African countries and South Africa which are able to supply more than 85% of their population with electricity.

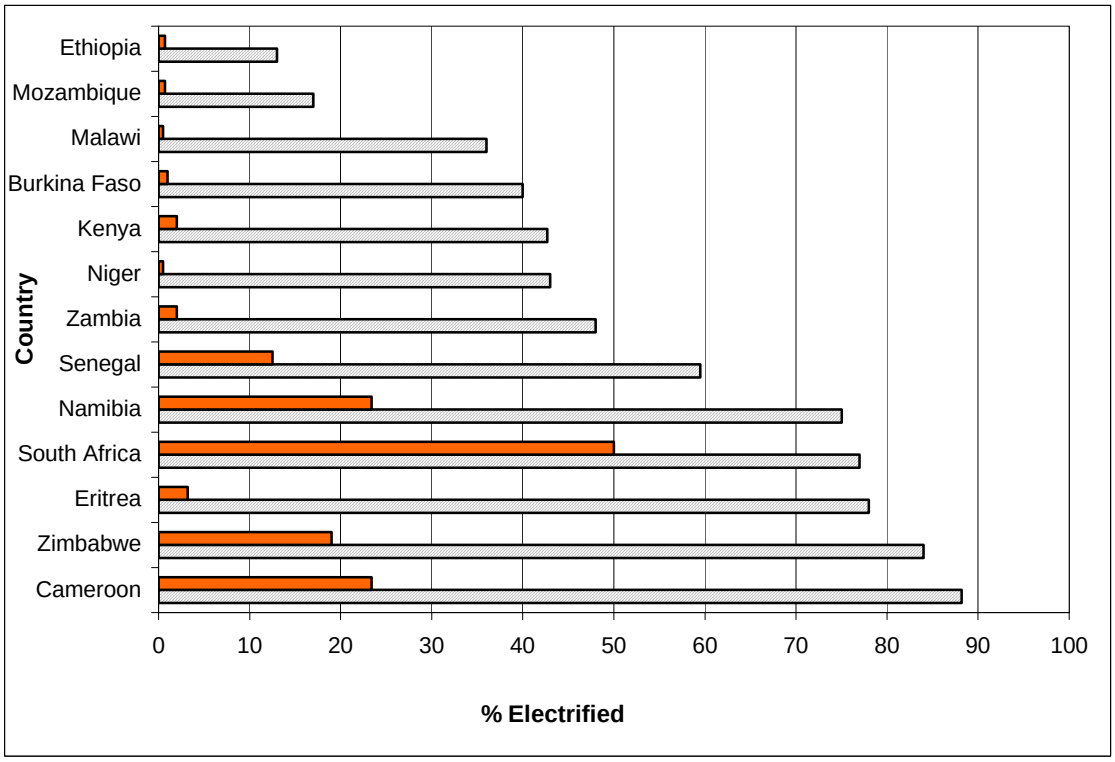
Figure 18: National Electrification Levels (2003/2004)



***Sources**:World Bank 2004; Pineau 2005 a & b, Habtetsion 2005 a & b, Dube 2005 a & b, Kalumiana 2005 a & b, Nyang 2005 a & b, Diarra 2005 b, Bassirou 2005 a & b, Kayo 2005 a & b, Sarr & Sokona 2003, AFREPREN Energy Data Handbook 2004, Kahyoza 2005 a & b, Tse 2005 a & b, SOPIE 2005*

Rural electrification levels are even much lower with the majority of the countries covered recording electrification levels of less than 10% in the rural areas – where the majority of the poor in Africa reside. With the exception of Cote d'Ivoire, Ghana, Zimbabwe, Nambia and Eritrea, available data also shows that even in urban areas where most of the electricity connections are, less than half of the households have access to electricity (Figure 19).

Figure 19: Urban and Rural Electrification Levels (2003/2004)



S***ources:*** *World Bank 2004; Pineau 2005a&b; Habtetsion, 2005a&b; Dube, 2005a&b; Kalumiana, 2005a&b; Nyang, 2005a&b; Diarra, 2005a&b; Bassirou, 2005a&b; Sarr & Sokona, 2003, Kayo 2005a&b; Kahyoza 2005 a&b; Tse, 2005a&b*

The high cost of providing electricity to dispersed rural populations, limited affordability, and the lack of financial resources to meet the capital investment and operating costs, continue to render these areas financially unattractive even after reform (Clark et al, 2005). Poor management of the rural electrification fund by the national utilities and agencies have also affected the electrification efforts to the majority rural population who can not afford the to pay for electricity. Consequently, in most of the countries, it is likely that the rural poor are unlikely to have access to electricity in the foreseeable future.

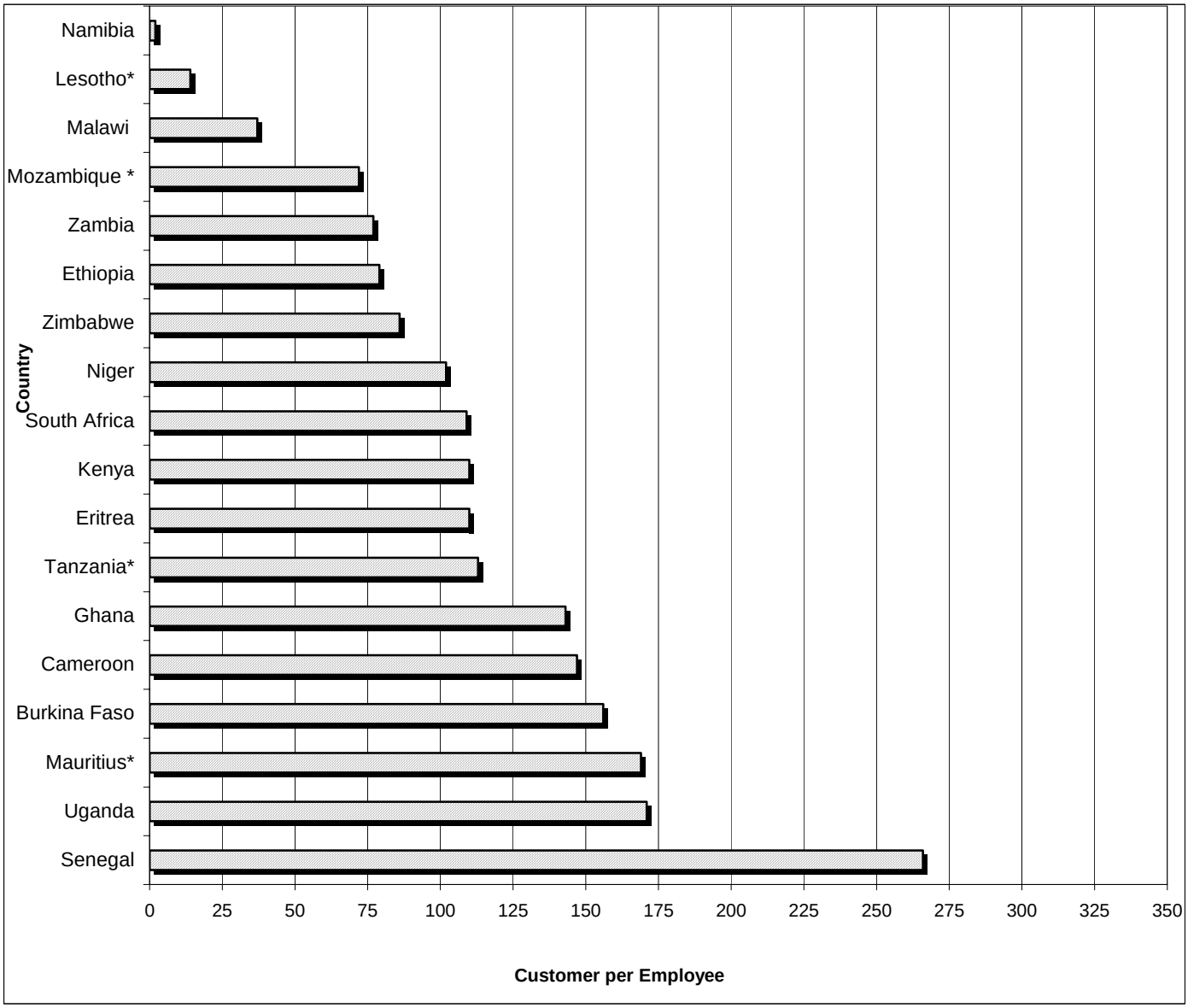
Number of Customers

In comparison to the national population in the respective countries, the number of customers is relatively low. While the number of customers has been growing steadily over time, its growth rate is much lower than the population growth rate. This also explains the low electrification levels discussed earlier.

An important indicator that partially corroborates the fact that utilities in the respective countries generally have low customer levels is the customers per employee ratio[9]. According to developing country norms, a utility with high customer levels should have a ratio of at least 125 customers per employee. However, with the exception of Burkina Faso, Cameroon and Ghana, the majority of the utilities in the countries covered in this study register ratios below the aforementioned norm which, in part, confirm low customer levels (see fig XX).

[9] Partially corroborates because the same indicators is mainly used to check whether the staffing levels of a utility.

Figure 20: Customers per Employee in Selected African Countries (2003/2004)10



Note: * - 2000 data

Sources: *Okumu 2003, World Bank, 2004, Habetsion 2005 a&b, Dube 2005 a&b, Kalumiana 2005 a&b, Nyang 2005 a&b, Bassirou 2005 a&b, Kayo 2005 a&b, AFREPREN Energy Data Handbook 2004, Kahyoza 2005 a&b, Tse 2005 a&b,*

[10] Uganda's customer per employee ratio is considerably high following retrenchment of employees and the unbundling of the utility leading to an independent distribution company whose data is provided in the graph.

Electricity Consumption

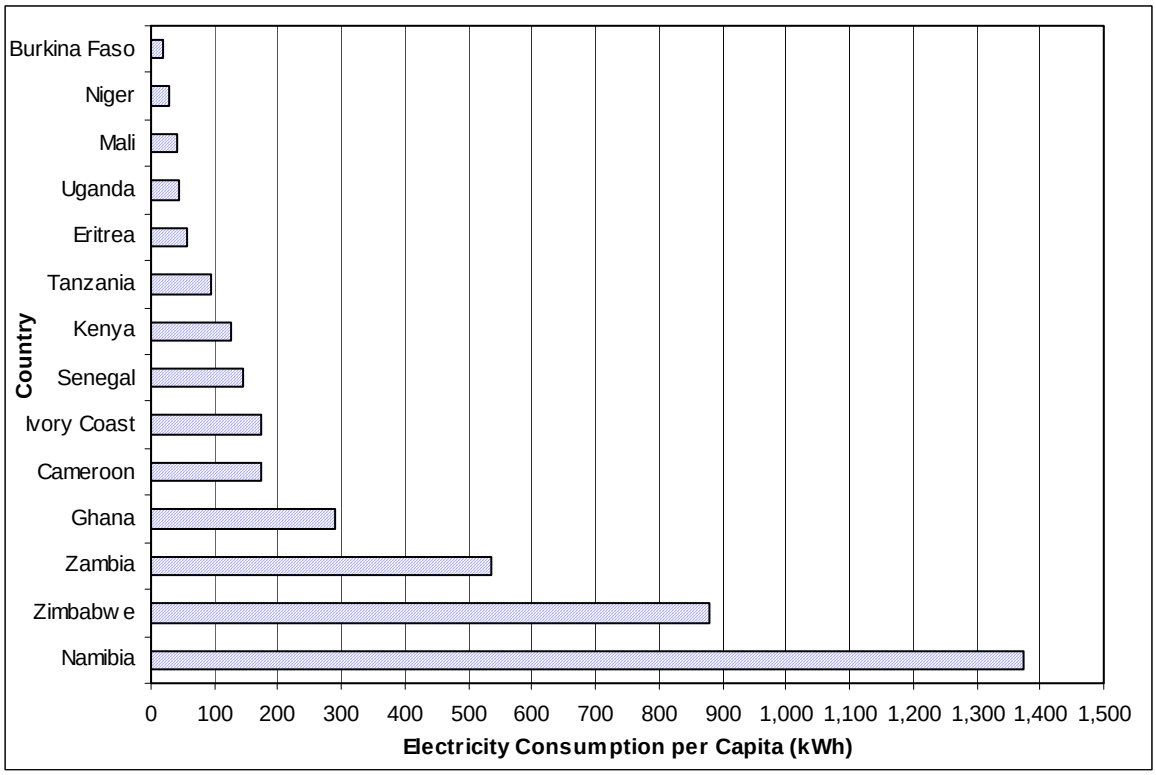
The average electricity consumption per capita in sub-Saharan Africa (excluding South Africa) is estimated to be about 124.4 kWh (World Bank, 2005). This level is well below the 3,860 kWh per capita in South Africa or even the 900 kWh per capita in North Africa (World Bank, 2005). Compared to northern African countries and South Africa, most of the countries covered in this study register low electricity consumption levels, with the exception of Namibia and Ghana as shown in the following table (Table 20):

Table 20: Electricity Consumption per Capita (2003/2004)

Country	Electricity Consumption per Capita (kWh)
Namibia	1,373
Zimbabwe	880
Zambia	537
Ghana	291
Mali	186
Cameroon	173
Cote d'Ivoire	172
Senegal	146
Kenya	126
Tanzania	93
Eritrea	58
Uganda	44
Niger	28
Burkina Faso	19

Sources: World Bank 2004; Pineau 2005a&b; Habtetsion, 2005a&b; Dube, 2005a&b; Kalumiana, 2005a&b; Nyang, 2005a&b; Diarra, 2005a&b; Bassirou, 2005a&b; Sarr & Sokona, 2003, Kayo 2005a&b; Kahyoza 2005 a&b; Tse, 2005a&b

Figure 21: Electricity Consumption per Capita (2003/2004)



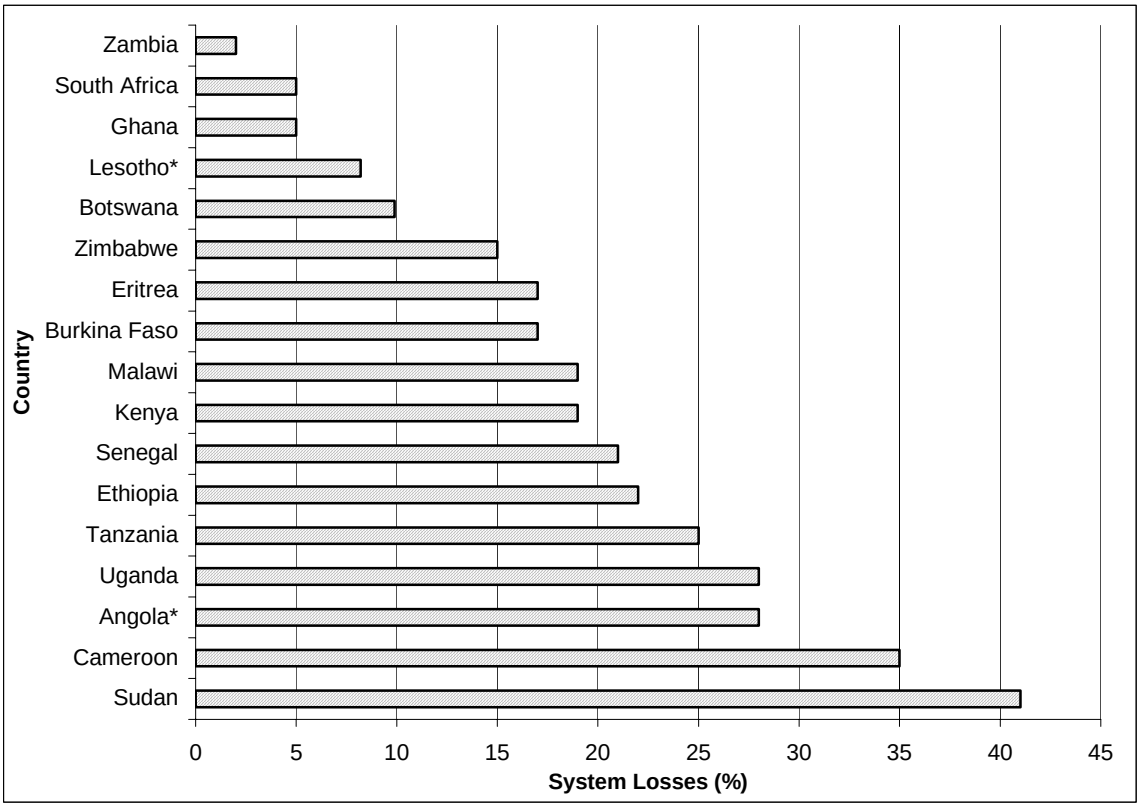
***Sources**: IEA 2004; World Bank 2004; CIA The World Factbook 2005, Pineau 2005 a & b, Habtetsion 2005 a & b, Dube 2005 a & b, Kalumiana 2005 a & b, Nyang 2005 a & b, Diarra 2005 b, Bassirou 2005 a & b, Kane 2005 a & b, Kayo 2005 a & b, Sarr & Sokona 2003, AFREPREN Energy Data Handbook 2004, Kahyoza 2005 a & b, Tse 2005 a & b, SOPIE 2005*

In some countries, it is reported that the per capita consumption of electricity has been declining (Clark et al, 2005). For example, in Ghana, while overall electricity access in the northern part of the country increased by more than 500 percent between 1991 and 2000, per capita consumption fell by almost 20 kWh per person over that period. Many households could not afford to pay for electricity and were forced to rely on other power sources for many of their daily activities or even disconnect their households from the network altogether. On the other hand, in Mali, per capita consumption of electricity has increased from 22 kWh per person in 1990 to about 40 kWh in 2002 while at the same time access levels increased almost threefold (Sarr and Sokona, 2004; Clark et al, 2005).

System Losses

Partly due to poor maintenance on the transmission and distribution system, the countries covered in this study are characterized by high system losses when compared with the international target of about 10%-12%. The power systems in some countries record figures as high as 41% (Figure 22).

Figure 22: System Losses in Selected African Countries (2003/2004)



Sources: *World Bank 2004, Pineau 2005 a&b, Habetsion 2005 a&b, Kalumiana 2005 a&b, Nyang 2005 a&b, Bassirou 2005 a&b, Kayo 2005 a&b, Sarr 2005 a&b, Kahyoza 2005 a&b, Tse 2005 a&b, AFREPREN Energy Data Handbook 2004*

* 2001 data

High levels of system losses such as those shown in the previous graph not only further constrain the amount of electricity delivered but also affect the financial performance of the electricity utilities discussed in the following section.

2.2.3 Financial Performance

The financial health of most of African electricity utilities such as those in the countries covered in this study is in part affected by their technical performance discussed in the previous section. One of the major drivers for power sector reforms in almost all the countries covered in this study is the poor financial of the utility. Prior to reforming their respective power sectors, a sizeable number of utilities recorded a string of loss-making experiences. Examples include electricity utilities in Zimbabwe, Kenya, Ghana, Uganda and Tanzania. In all the four countries, reforms brought a turnaround in the financial performance of their electricity utilities.

For the countries covered in this study, Table 21 provides an overview of their financial performance.

Table 21: Key Financial Indicators for the Electricity Industry Indicators (2003/2004)

	Annual Revenue (Usd)	Profit/Loss (Usd)	Tariff Levels	Debtor Days
Countries				
Burkina Faso	70,010,524		0.16	
Zambia	**111,000,000			
Eritrea	28,400,000	-1,860,000	11.7	108
Namibia	79,874,364	9,027,314	3.97	34
Cameroon	284,000,000	43,000,000	0.11	
Zimbabwe	**465,585		**3.9	*45
Senegal	223,530		0.14	99
Tanzania	181,000,000	60,900,000	8	0
Ghana	*2,097,378	391,105	***0.02	195
Kenya	311,389,629	11,690	9	
Cote d'Ivoire				
Niger				
Uganda	158,038,404		8.53	194
Mali				

Sources: World Bank 2004; Pineau 2005a&b; Habtetsion, 2005a&b; Dube, 2005a&b; Kalumiana, 2005a&b; Nyang, 2005a&b; Diarra, 2005a&b; Bassirou, 2005a&b; Sarr & Sokona, 2003, Kayo 2005a&b; Kahyoza 2005 a&b; Tse, 2005a&b

Note:

* 2002 data

** 2001 data

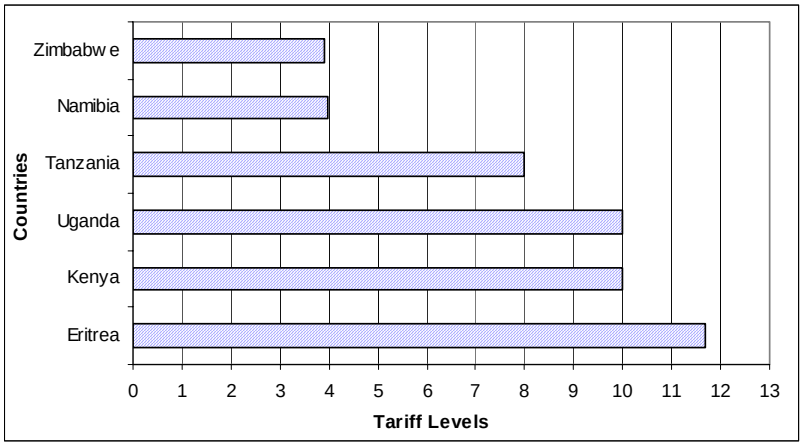
*** 2000 data

As can be seen from Table 21, the amount of revenue collection by utilities is significant. This is mainly due to the monopoly status of the state owned electricity distribution utilities as well as tariff reforms and improved operations as a result of power sector reforms. Latest available data suggests that, compared to the early to mid-1990s when roughly 60% of sub-Saharan African utilities' financial performance was inadequate (Covarrubias, et al, undated), most utilities have now become profitable with the exception of a few such as Eritrea that continue to register losses.

Controlling the high system losses and low electrification levels combined with higher tariff levels, electricity utilities should be able to realize higher revenue levels. Tariff reforms will particularly

continue playing a significant role in the profitability of electricity utilities in sub-Saharan Africa. Essentially, tariff reforms comprise of two components: removal of subsidies and reflection of true cost of delivery by taking into account the cost of fuel used for electricity generation as well as changes in key national and global macro-economic factors e.g. inflation, foreign exchange fluctuation, world oil prices, etc. The following figure (Figure 23) shows the prevailing average tariff levels in the countries covered by this study.

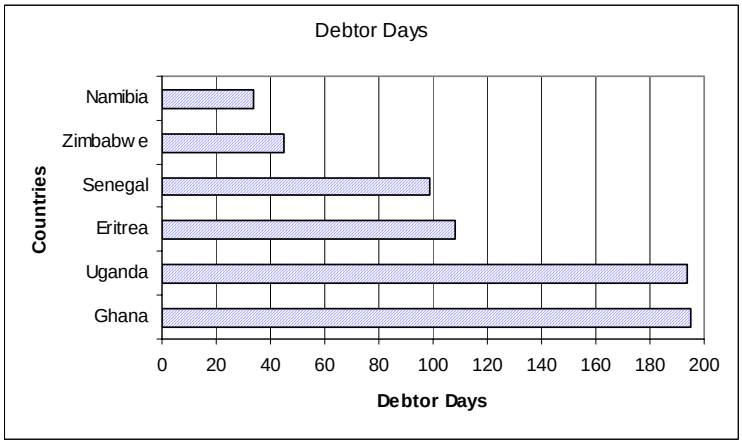
Figure 23: Prevailing Average Tariff Levels in Selected Countries (2003/2004)



***Sources**: World Bank 2004; Habtetsion 2005 a & b, Dube 2005 a & b, Nyang 2005 a & b, Kayo 2005 a & b, AFREPREN Energy Data Handbook 2004, Kahyoza 2005 a & b, Tse 2005 a & b, Okumu, 2003, Opio, 2005*

As shown in the Figure 23, the majority of the countries have raised their electricity tariff levels above the long-run marginal cost (LRMC) usually in the range of USc 6 - 8 in most sub-Saharan African countries - an indication of the establishment of tariff setting mechanisms to reflect the true cost of delivering electricity. It is noteworthy pointing out that while tariff reforms are critical to the financial health of the electricity utilities, for financial performance to be sustainable, these reforms should be complemented by system losses reduction and increasing the customer base through enhanced electrification. In addition, it is imperative that debt collection is also enhanced as a significant number of the utilities covered in this study register poor debtor days. With the exception of Namibia, the rest of the countries record debtor days are well above the international norm of 30 days.

Figure 24: Debtor Days (2003/2004)



***Sources**: World Bank 2004; Habtetsion 2005 a & b, Dube 2005 a & b, Kayo 2005 a & b, AFREPREN Energy Data Handbook 2004, Kahyoza 2005 a & b, Tse 2005 a & b*

To conclude, most of the power utilities in the countries covered in this study appear to record continued unsatisfactory technical but an improved financial performance. A tentative conclusion that can be drawn from this assessment is that power sector reforms in most of the sub-Saharan African countries have largely focused on improving the financial health of the electricity utility, perhaps at the expense of technical performance which includes,among others, improving the population's access to electricity. The following section discusses the status of power sector reforms and regulatory measures instituted in sub-Saharan Africa.

Chapter 3: Status of Power Sector Reforms and Regulatory Measures

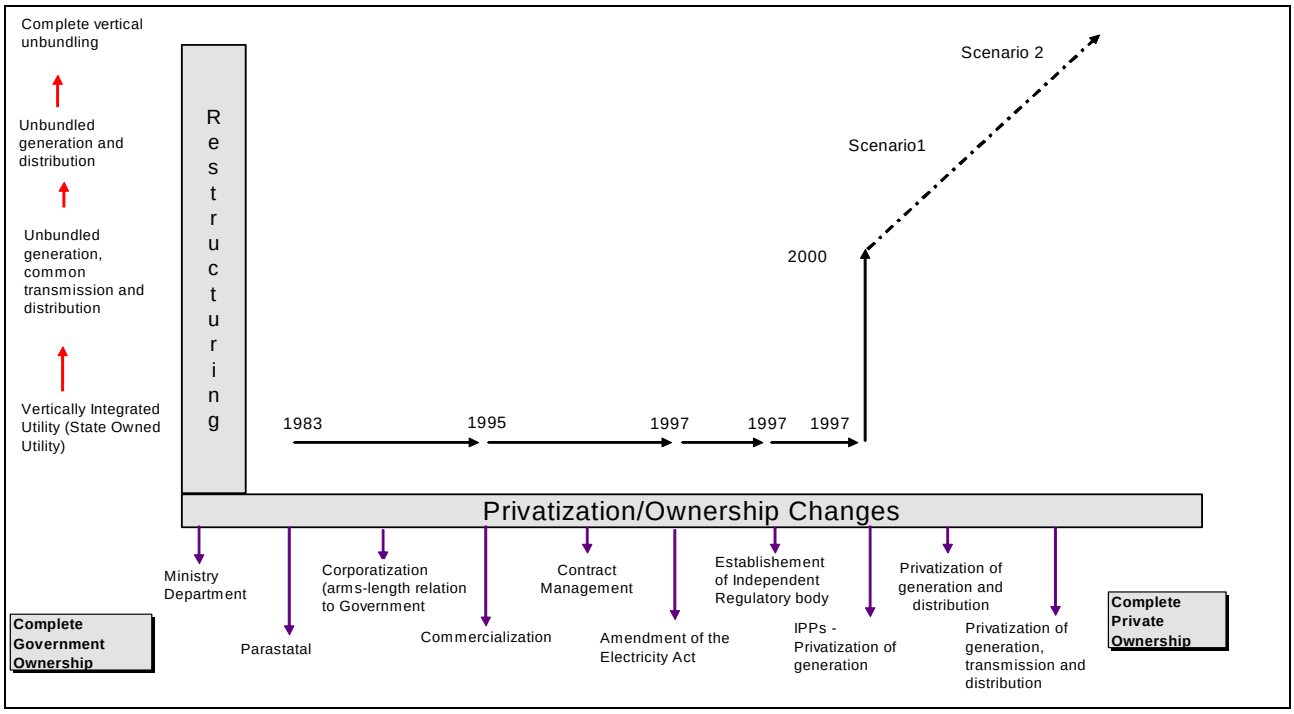
3.1 Description of Power Sector Reforms

Power sector reform is often equated with deregulation and reduction of government participation in the electricity industry. The major reforms that have been taking place in Africa are structural changes and privatization of power utilities. Structural changes refer to the process of unpackaging vertically intergrated utilities into separate generation, transmission and distribution companies (vertical unbundling) and conversely unpackaging national utilities into smaller district or provincial utilities (horizontal unbundling). However, horizontal unbundling appears to be feasible in very large economies such as in the United States of America. In Africa, only Nigeria appears to be considering this option (Bala, 2003).

The privatization process is essentially an issue of changing ownership of assets. It commences with bringing the assets of the state-owned utilities under a parastatal. The parastatal is thereafter commercialized (also referred to as corporatised) and it ultimately goes through several other steps to become a fully privately owned entity. The most common privatization path undertaken by most African countries in power sector reforms has been the corporatisation, commercialization, contract management and stop at allowing the entry of independent power projects (IPPs).

The following figure (Figure 25) for Kenya's electricity industry illustrates the typical restructuring and privatization paths followed by the majority of the countries covered in the study. However, not all countries strictly follow the path nor do they also adopt all reform options. For example, contract management does not appear to be a popular reform option among the countries studied (see Table 22).

Figure 25: Sample Graph of Reform Options



Scenario 1 and 2 = Possible future reform and possibly extreme options complete privatization and unbundling.

Source: Compiled by authors

Figure 25, representative of trends in sub-Saharan African countries, appears to indicate that a lot more privatization has been undertaken than restructuring. In addition, restructuring is, in most countries, implemented well after the entrenchment of privatization.

Furthermore, Figure 25 also illustrates the long time lag between implementation of the different reform options. For example, there is often a bigger lag between commercialization and the amendment of the Electricity Act. However, as soon as the Act is amended several other developments take place almost at the same time. For example, it is not uncommon to have the Electricity Regulatory Agency and IPPs established in the same year as the Act. As mentioned earlier, unbundling takes place much later mainly due to the legal changes to the utility that are required including asset transfers procedures as well as the legal establishment of the new institutions being formed. In addition, the long time lag is also partly due to lengthy appointment procedures for the new institutions.

In terms of restructuring, some countries such as Kenya have opted to only unbundle the generation segment. Others such as, Uganda and Zimbabwe, have taken the extreme option of completely unbundling the entire formerly integrated utility into generation, transmission and distribution.

In the case of West Africa, the reforms of the electricity sector were implemented at different time intervals in different countries: Côte d'Ivoire was the first to implement reforms in the early 1990s, followed by Senegal (1998), Mali (, The Gambia, and, finally in 2003, Benin. In all of these cases, the key objectives of the reforms were to enhance technical efficiency (renovation and extension of the grid, improvement of the quality of electricity), financial and managerial performance– none of them made explicit mention of improving the poor's access to electricity or addressed environmental concerns such as increased use of renewables and efficiency options. This is in spite of the fact that many of the countries have listed poverty reduction as one of their national priorities by adopting Poverty Reduction Strategic Papers (Sarr, S., Fall, L., Togola, I. and Sokona, Y. 2003)

3.2 Status of Power Sector Reforms

The following table (Table 22) summarises the status of implementation of the various power sector reform options. It includes the status of legal, regulatory and institutional reforms in the countries covered in the study.

Table 22: Status of Reform Implementation

	Commercialisation/ Corporatization	**New/Amended Electricity Act**	**IPPs**	**IPDs**	**Regulation Agency**	**Rural Electrification Agency**
Kenya	Implemented	Implemented	Implemented	No	Implemented	Pending
Namibia	Implemented	Implemented	Implemented	Implemented	Implemented	No
Tanzania	Implemented	Pending	Implemented	Implemented	Pending	Pending
Uganda	Implemented	Implemented	Implemented	Implemented	Implemented	Implemented
Zambia	Implemented	Implemented	Implemented	No	Implemented	Implemented
Zimbabwe	Implemented	Implemented	Pending	Pending	Implemented	Implemented
Cote d'Ivoire	Implemented	Implemented	Implemented	Implemented	Implemented	No
Niger	Implemented	Implemented	Pending	No	Implemented	Pending
Mali	Implemented	Implemented	Implemented	No	Implemented	Implemented
Ghana	Implemented	Implemented	Implemented	Implemented	Implemented	No
Eritrea	Implemented	Implemented	Pending	Pending	Implemented	Pending
Cameroon	Implemented	Implemented	Pending	Pending	Implemented	Implemented
Burkina Faso	Implemented	Implemented	Pending	No	Implemented	Implemented
Senegal	Implemented	Implemented	Pending	Pending	Implemented	Implemented

The following section briefly discusses the status of each of the reform options mentioned in the Table 22.

3.2.1 ***Commercialisation/ Corporatization***

Commercialization/corporatization (hereinafter simply referred to as commercialization) appears to be the most popular reform option executed in the countries covered in the study as the utilities in all the countries have implemented the option (see Table 22). Essentially this is because this is normally the first step in the reform of state owned utilities. The key objective of this option is to ensure the utility runs its operations based on business principle of profit-maximization. In Africa, there have been two key forms of commercialization reforms, namely: contract management and tariff reforms.

Contract Management[11]

Contract management is increasingly becoming a common feature in state-owned power utilities, particularly in West African countries. A number of countries have attempted to introduce contract management to improve efficiency and profitability of their utilities. Countries in the study that have incorporated this option include Uganda, Tanzania and Ghana. Other countries in the continent include Malawi, Guinea Bissau, Morocco and Togo. Most of these contracts involve an agreement through which operational management of the utility or part of it is delegated to a firm of management consultants, but the assets and investment decisions remain under the Government.

Box 1

The foreign firms involved in contract management in Africa have mainly been dominated by French entities. More recently, South African firms (Net Group Solutions and Eskom Enterprises – a subsidiary of the South African utility, Eskom), have begun showing interest in the African power utility contract management market. South-African led contract management initiatives are now underway in Malawi, Uganda and Tanzania.

Tariff Reforms

Prior to the advent of electricity regulatory agencies and power sector reforms in general, electricity tariffs were approved and, in some cases, determined by Government. This was during the period when provision of electricity was perceived as a social welfare service rather than a commercial

[11] According to a recent study of the World Bank Group entitled "L'électricité au service du développement: Examen de l'action menée par le groupe de la Banque Mondiale pour promouvoir la participation privée dans le sectuer de l'électricité" by Rafael Domingez, Fernando Manibog and Stephan Wegner (2003), the contract management in most parts of the world have failed.

service. Governments, therefore, strived to ensure that electricity was affordable to all by keeping the tariffs low and, to a large extent, subsidised.

Power sector reforms in the region have led to, among other developments, increases in the tariff levels in line with the following objectives:

- To recover the cost of electricity generation, transmission and distribution;
- To fairly and equitably spread the above costs to consumers based on the true cost of service delivery, consumption levels & patterns, and affordability to pay, and;
- To promote the efficient use of electricity.

Table 23 shows recent tariff increases in the region including countries covered in this study.

Table 23: Recent Tariff Increases

Country	Average Tariff Increase	Year of Tariff Review	Reason for Tariff Review
Ghana	326 %	1998	General tariff review
Zimbabwe	70%	2000	Annual tariff review
Uganda	56 %	2001	General tariff review
Malawi	35%	2000	Effect of foreign exchange adjustment
Kenya	25 %	1999	General tariff review
Ethiopia	26 %	1998	General tariff review
Eritrea	18%	2003	Annual tariff review
Namibia	10%	2001	Annual tariff review
Cameroon	7.5%	2004	Annual tariff review
Niger	6.0%	2002	Annual tariff review
S. Africa	5.5 %	2001	Annual tariff review

Sources: Pineau, 2005; Dube, 2005; Kayo, 2005; Semere, 2005; Mamadou, 2005; Gboney, 2001; AFREPREN/FWD, 2001a; 2000c; Nyoike and Okech, 2001; Teferra, 2001; UEDCL, 2001; NER, 2000; NER, 2001.

While an increase in tariffs has affected the poor, however, in some countries, for example, Kenya, Uganda and South Africa, tariff reforms have provided provisions to ensure electricity is affordable for the poor. In Kenya for instance, the tariff structure provides for a life line tariff for the first 50 kWh aimed at the poor. The lifeline tariff is essentially below the true cost of delivery of electricity

and therefore subsidized. In South Africa, the poor greatly benefit from a newly introduced tariff structure which provides for free 50 kWh of electricity per month (Davidson and Mwakasonda, 2004).

3.2.2 New/Amended Electricity Act

In the countries covered under this study, the Electricity Act often provides the legal and regulatory framework. In these countries, the legal and regulatory framework was originally designed for state-owned or Government-regulated power utilities, with little or no provision for private sector participation. Recently, with the exception of Tanzania, all other countries covered in this study have amended their Electricity Acts leading to a number of important regulatory changes as shown in the following table (Table 24):

Table 24: Changes in the Legal and Regulatory Framework

Provision in the Electricity Act	Previous Legal and Regulatory Framework	New Legal and Regulatory Framework
Regulatory agency	Regulation by the Ministry in conjunction with the public utility	Regulation by an independent regulatory body
Rural electrification agency	Rural electrification programme administered by Ministry and/or utility	Rural electrification administered by an independent body
Licensing of IPPs: - For own use	Application to Ministry through the public utility.	In most countries by ERB. Others (e.g. Kenya) by Minister on advice from ERB.
- For sale to public utility	Non existent. Generation sole responsibility of utility.	Power purchase agreement approved by ERB.
Licensing of IPDs	Non existent. Distribution sole responsibility of utility.	By the regulatory body.
Gazette of license application and license granted	Not mandatory since private power generation was licensed for applicant's own use.	A requirement for the regulatory body (and in some countries the applicant) for applications and in some countries for license granted.
Tariff setting	Proposed by public utility and	Proposed by utility and

Provision in the Electricity Act	Previous Legal and Regulatory Framework	New Legal and Regulatory Framework
	approved by Ministry.	approved by the regulatory body. In some countries (e.g. Kenya) the regulatory body can also review tariff without request by utility.
Appeals and dispute resolution	On a point of law, the law courts.	The regulatory body, Minister, Arbitration tribunals and law courts.

IPPs – Independent power producers

IPDs – Independent power distributors

***NOTE**: In countries where there is no regulatory body established, the Minister concerned continues to be the main regulator.*

Sources: Pineau 2005b; Habtetsion, 2005b; Dube, 2005b; Kalumiana, 2005b; Nyang, 2005b; Diarra, 2005a; Bassirou, 2005b; Sarr & Sokona, 2003, Kayo 2005b; Kahyoza 2005a; Tse, 2005b; NARUC, 2003; Government of Ghana, 1997; Government of Kenya, 1997; Government of Uganda, 1999; Government of Zambia, 1995; Federal Government of Ethiopia, 1997; Federal Government of Ethiopia, 1999

3.2.3 Establishment of Electricity Regulatory Agencies

As shown in Table 22, the establishment of independent regulatory bodies for the power sector alongside the amendment/enactment of new Acts is the second most popular reform options implemented in the countries under study. Available records indicate that the establishment of the Electricity Regulatory Agencies is a rapidly adopted reform option. For instance, by the end of 1997, only Ghana, Kenya, Malawi and Zambia had set up independent regulatory agencies. Since then, nine other countries have established regulatory agencies including Cote d'Ivoire, Uganda, Namibia, Zimbabwe, Niger, Mali, Eritrea, Cameroon, Burkina Faso and Senegal.

However, although the regulatory bodies are expected to be independent, past developments in some countries cast doubt over the autonomy of these bodies, notably in Kenya, Malawi and Uganda (Okech and Nyoike, 2001; Matinga, 2001 and Kafumba, 2001, AFREPREN/FWD, 2001a).

The problem of inadequate autonomy for the regulatory agencies can be traced back to the process of appointment of their board members. Apart from the Ghanaian regulatory agency whose process of board members appointment appears to be consultative and transparent (see Table 25), the board members in other regulatory agencies are Presidential and/or Ministerial appointees which inhibit the regulatory agencies' autonomy.

Table 25: Summaries of Electricity Regulatory Bodies in Sub-Saharan Africa

Country	No. of Members	Sector(s) Regulated	Appointment of Board Members	Primary source of funding	Degree of Autonomy
Ghana	7	Electricity, Petroleum, Water	By President in consultation with the Council of State	Parliament appropriation.	Autonomous
S. Africa[12]	7 (min) to 9 (max)	Electricity	By Minister of Minerals and Energy, after public nomination process	Levies.	Autonomous
Kenya	7	Electricity	Chairman appointed by President, other members appointed by the Minister for Energy	Levies.	Semi - autonomous
Malawi	13	Electricity	By President	Levies.	Semi - autonomous
Namibia	5	Electricity	By Minister of Mines and Energy	Levies.	Semi - autonomous
Uganda	5	Electricity .	By the Minister for Energy and approved by Cabinet	Levies.	Semi - autonomous
Eritrea	5	Electricity	By President	Parliament appropriation and licensing fees.	Semi - Autonomous
Zambia	7	Electricity, Petroleum.	By Minister of Energy	Parliament appropriation.	Semi - autonomous
Rwanda	8	Electricity, Gas, Water, Transport, Telecommunications & Waste management	By Prime Minister	Parliament appropriation and licensing fees.	
Cameroon	9	Electricity	Government	Levies	Semi - autonomous

[12] A new energy regulatory body - National Energy Regulator of South Africa (NESRA) - is soon to be launched to regulate not only the electricity sector, but also the gas and oil sectors.

Sources: Electricity Acts of Ghana, Kenya, Malawi, Namibia, South Africa, Uganda, Eritrea, Zambia; IDURI, 2001; National Electricity Regulator (S. Africa) Website;; NARUC, 2003; Encodivoire.com, 200; Pineau, 2004

It is worth highlighting that regulatory bodies are necessary when the sector is open to several competing or closely complementary but independent actors. Unless these actors are themselves independent, one cannot expect the establishment of an independent and effective regulatory body. Therefore, further assessment of the various actors, their mandates, functions and ownership structures is proposed in order to better understand the role of the regulatory body.

3.2.4 Independent Power Producers (IPPs)

Independent Power Producers (IPPs) constitute an important form of private sector participation in Africa's power sector. With demand outstripping supply in many African countries, independent power projects are becoming a major source of new power generation capacity in these countries. By the end of 2002, about 35% of the planned IPPs were operational. The balance were either in progress or their dates of implementation were not yet due.

In the region, except in a few countries such as Mauritius, reforms appear to favour large and centralised power projects. In spite of significant potential, IPP developments have not considered small to medium scale local private investments through decentralised options such as mini-grids and cogeneration in the sugar and wood industries.

In many African countries, power sector reform appears to have involved limited local private participation in IPP development. Current trends seem to indicate that, in the medium term, the exit of the state from electricity generation (and eventually from the entire electricity industry), would effectively hand over the industry to non-national operators. In political terms, this may be an unsustainable arrangement. Without significant local involvement, it is possible that reforms may be reversed in the future mainly because there would be no significant local stakeholder group.

Local private participation in IPP development has mainly been hampered by the emphasis on large-scale investment. In most African countries, the size of IPPs (both implemented and proposed) is greater than the prevailing installed capacity (largely from the state-owned utilities), an indication of heavy emphasis on large-scale investments. Large-scale IPP developments may have several drawbacks with regard to local private participation in the region.

Firstly, large-scale IPP development is generally a high-tech capital-intensive endeavour which requires heavy capital investment which dissuades local investors. Small-scale IPP development,

for example, a cogeneration plant, involves technology that can easily be locally managed. In addition, the capital requirements are modest and can be sourced locally.

Secondly, large-scale capital-intensive IPP developments invariably attract the politically connected rent-seeking class. The controversial IPP projects in Zimbabwe involving YTL (a Malaysian company), in Tanzania involving IPTL (another Malaysian company) and Kenya are classic examples of the disarray that the rent-seeking class can cause. There could, therefore, be a case to examine smaller IPPs which may be less capital intensive and would not attract the interests of the local rent-seeking class.

Mauritius provides a model example of the potential of local private participation in the power sector. About 40% of annual electricity generation comes from local privately-owned and operated bagasse-based cogeneration plants within the sugar industry (Veragoo, 2003). Overtime, the local bagasse-based cogeneration industry has made steady progress in technology development, starting with modest investments of about US$ 4 million in bagasse-based cogeneration power plants comprising of conventional low-pressure boilers with installed capacity in the range of about 10-15 MW. After steady growth, local private investors in partnership with foreign investors have recently made an investment of about US$ 100 million in a hi-tech high-pressure bagasse-based cogeneration power plant with an installed capacity of 70 MW (Quevauvilliers, 2001).

The Mauritian example demonstrates the potential financial and technical capability and viability of local private investors in IPP development. Appropriate policy and financial incentives could encourage the development of locally owned IPPs. The ideal entry point, as in the case of Mauritius, is likely to be renewable energy options such as bagasse-based cogeneration, mini/micro hydro, off-grid and photovoltaic that can be developed by IPPs and local organizations in a decentralized manner.

3.2.5 Independent Power Distribution

In the countries covered in the study and indeed in the sub-Saharan African region, very few independent power distribution (IPD) utilities have been established. The only countries where IPDs have been established are Namibia, Tanzania, Uganda, Cote d'Ivoire and Ghana. When coupled with the establishment of Rural Electrification Agencies (REAs), privatization of distribution is likely to benefit the often forgotten urban poor as in such a case IPDs would cover on urban areas while rural areas covered by REAs.

Box 2

Oshakati Premier Electric (Pty) Ltd is an Namibian IPD that is touted to be a good model for the region. It is a 50/50 joint venture established in 2000 between the Oshakati Town Council and NamPower's business arm Premier Electric (Pty) Ltd. The entity is governed by a Board of Directors and run by a management team appointed by the Board. Oshakati Premier Electric is committed to the development of the town on business and economic principles and is responsible for supplying power to the people of Oshakati, maintaining and upgrading the street and traffic lights, existing and future networks, as well as providing other related services including accounts payments, power applications, electricity tokens, etc.

3.2.6 Institutional and Regional Reforms

There are a number of important institutional reforms that have taken place in the region. First and foremost, the establishment of Electricity Regulatory Agencies has enable Ministries of Energy focus on policy development. Some of the policies developed have a direct bearing on the poor. For example, in most of the countries covered in the study, there are newly developed policies to enhance rural electrification through the establishment of Rural Electrification Agencies (REAs). The REAs have the mandate of implementing rural electrification programmes. Already there are operational REAs in Uganda, Zambia, Zimbabwe, Mali, Eritrea, Cameroon, Burkina Faso and Senegal.

Another important development is the establishment of power pools as well as the introduction of cross-border electricity distribution. These developments present clear opportunities to reduce the uneven geographical distribution of energy resources (especially hydropower) in the region, reduce dependency on importation of fossil fuel and improve energy security.

The earliest power pools in sub-Saharan Africa is the Southern African Power Pool (SAPP) was created in 1995 to spearhead regional energy trading through the development of interconnectors and a coordinated generation expansion programme. The pool comprises the 12 SADC member countries (see map) represented by their national power utilities, all of which aim to optimize regional energy resources and support each other during emergencies.

Figure 26: Transmission Infrastructure and Interconnection of the Southern Africa Power Pool

Source: Dube, 2005

Chief executives of the participating utilities make up an executive committee that reports to SADC energy ministers. Meanwhile, senior managers from the transmission system operators, energy trading, planning and environmental divisions of each utility form a management committee that feeds planning, operating and environmental information into the executive committee. The pool sets rules that have to be adhered to by members in planning and operating their systems. This means that apart from meeting the national performance expectations and regulatory requirements within their respective countries, electricity utilities have obligations to meet requirements imposed by virtue of its membership of the Southern African Power Pool. The existence of the power pool has also influenced the performance of the power sector in some of the member countries.

For member countries, their membership to SAPP has meant that security of electricity supply is guaranteed though availability of imports from within the region. The countries also benefit from sharing generation reserves. This means that investments on capacity additions to meet reserves are minimized, as in contingency situations, member countries can call for emergency supplies from other members of the pool. Noting the benefits of the SAPP, other power pools have since emerged

in other regions of the continent such as the East African power poor and the West African power pool.

To sum up, full privatization of generation and distribution, implying that all generation and distribution entities in the country are wholly private owned, has not taken place in any of the countries under study. Instead, privatization of generation and distribution has mainly taken the form of partial private ownership of utility assets through equity, the awarding of concessions and contract management - which again very few African countries have implemented.

Figure 27: Summary of Status of reforms in the various countries

Competitive Generation and Distribution				
Fully Unbundled Utility		• Zimbabwe	• Uganda	
Multiple Generation with Single Buyer (Monopsony)		• Kenya • Niger • Senegal • Mali • Zambia	• Cameroon • Cote d'Ivoire • Tanzania • Namibia • Ghana	
Monopoly (Vertically Integrated Utility)		• Eritrea • Burkina Faso		
	Sector wholly owned and managed by Government	**Public Corporations without contract management with private sector**	**Public Corporations with contract management with private sector**	**Sector wholly owned and managed by private sector**

Ownership changes /Management

Source: Compiled by authors

However, while a significant number of countries are planning the sale of Government shares in the power utilities in the future, some countries such as Senegal and Mali have reverted back to state ownership from privatization of their electricity utilities. There are important lessons that can be drawn from these developments. First and foremost, it appears that privatization of the distribution appears to be more difficult to implement than privatization at generation. Secondly, by examining well performing utilities in the region such as those in Zimbabwe, Mauritius and South Africa, it can be concluded that privatization has its benefits but it is not the ultimate solution to good performance of the utility. The utilities in the aforementioned countries appear to have performed relatively well even without privatization. Consequently, the development in Senegal and Mali might deter other countries in the region from privatizing their utilities. Instead, the trend might be to implement other reform options that address specific challenges to the performance of the utilities.

Chapter 4: Socio-Economic Impacts of Power Sector Reforms

The combination of low income levels and inadequate access to cleaner energy sources such as electricity implies that the rural poor in sub-Sahara Africa face a vicious cycle. While traditional biomass energy is harmful to the poor who predominantly use it, their low incomes make it difficult for them to obtain electricity services as well as limits the scope of income generating activities that they can be engaged[13]. Consequently, the rural poor have to rely on biomass, which is harmful to their health, and which contributes to keeping them in a state of poverty (GNESD, 2003).

There is a limited number of studies assessing the socio-economic impacts of power sector reforms in sub-Saharan Africa. In part, the limited number of assessments on the impact of power sector reforms, especially on the poor, can be linked to the scanty and poor data on the electrification of the poor. Power utilities, Ministries/Departments of Energy and regulatory agencies appear not to keep track of electrification of the poor. Available data sets on electricity consumers do not specifically categorize the data according to income groups ("poor" and "non-poor"). Therefore, based on the limited data available, the following discussion assesses the socio-economic impacts f power sector reforms. This discussion examines both adverse and positive impacts of power sector reforms.

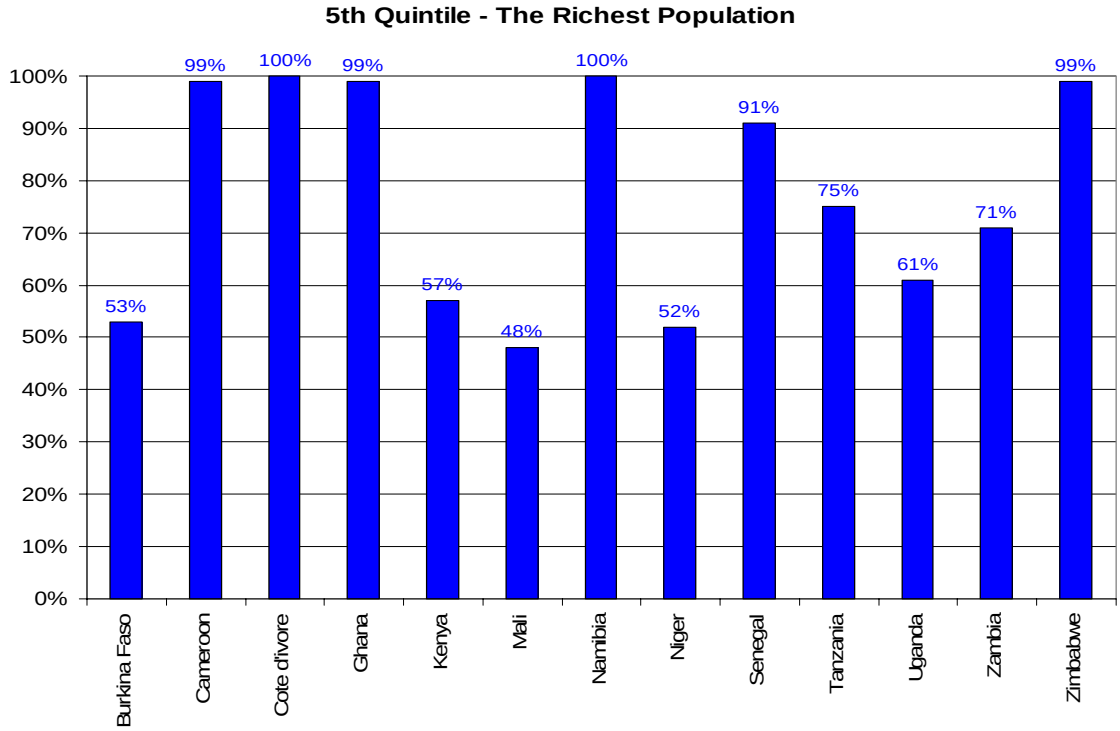
4.1 Adverse Socio-economic Impacts of Power Sector Reforms

Some of the most recent assessments of socio-economic impacts of power sector reforms especially on the poor include research studies carried out by the Global Network on Energy for Sustainable Development (GNESD), UNEP, World Resources Institute (WRI) and more recently by ESMAP. Following an assessment of available empirical evidence, the studies by GNESD tentatively conclude that the current set of reforms have either had a neutral or adverse impact on the poor and should be redesigned especially if the reforms are to be justified under a poverty-reduction agenda (Karekezi and Sihag, 2003). This finding appears to concur with the assessments of recent ESMAP studies (see Clark, et al, 2005; Estasche, 2005) as well as others (albeit non-empirical) recently undertaken by UNEP and WRI (see Wamukonya, 2003; Byrne & Mun, 2003; Fall & Wamukonya, 2003; Agbemabiese, Byrne & Bouille, 2003; Lash, 2002; Bouille, Dubrovsky & Maurer, 2002; Dubash & Rajan, 2002; Edjekumhene & Dubash, 2002). The key negative impacts on the poor identified all the four sets of the aforementioned studies include:

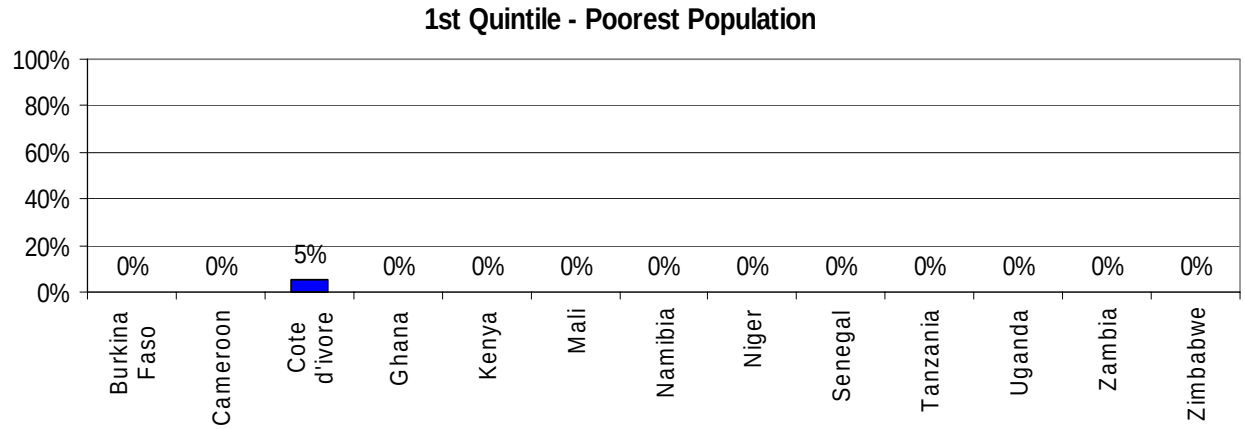
[13] For the poor, up-front costs of electricity connection and associated electrical devices are often prohibitive.

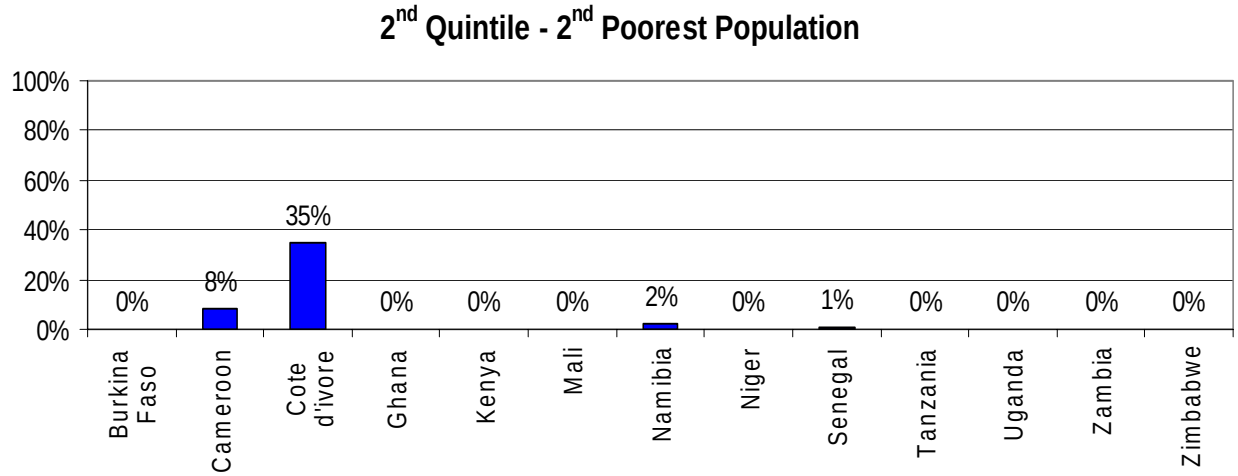
- Reduction in electrification/connection rates[14];
- Increased tariff levels; and,
- Decline in electricity consumption.

Perhaps the most outstanding social impact of power sector reforms is the inability of reforms to increase access to electricity among the poor after 15 years of reform! The results of an assessment of electricity access levels in the countries covered in this study by Estache (2005) corroborate the findings of the aforementioned empirical study carried out by GNESD. Both studies make a resounding conclusion that power sector reforms have not delivered electricity to the poor. To illustrate these findings, the following graphs compare electricity access levels between the poor and the non-poor. Invariably, almost the entire population of the non-poor in most countries enjoys electricity services whereas the poor appear to have no access to electricity at all.



[14] Refers to the pace of electrification.





Source: Estache, 2005; Karekezi, et al., 2003, Ogunlade, D. and Mwakasonda, S. 2003, and Sarr, S., Fall, L., Togola, I. and Sokona, Y. 2003.

In most countries in the region, reforms appear to have failed to link increased electricity access to the poor and rural electrification to the overall strategy of improving the power sector performance. For example, the issue of licenses and concessions are not closely linked to the ability of the licensee/concessionaire to increase electricity access among the poor. In addition, the newly unbundled (and privatised) distribution utilities do not appear to have rural electrification targets that are linked to future tariff adjustments. Furthermore, even in cases where there exists explicit electrification targets entrenched in the concession of the private electricity distribution utility, such as in Cameroon, the targets have not been met. Worse still in Cameroon, the plight of rural households with electricity connections is uncertain as it is reported that the private electricity distribution utility might discontinue serving rural areas citing unfavourable returns (Pineau, 2005).

It is unclear whether the role of the regulatory agency and the Electricity Act in terms of the responsibilities of the various players is explicit.

One of the outcomes of power sector reforms is the amendment of the Electricity Acts. A fundamental amendment to the Acts is the provision for enhancing rural electrification as a strategy for reaching the poor. However, a textual analysis of the amended Electricity Acts in several countries indicates that most of the Acts do not provide new and innovative initiatives to ensure increased electrification of the poor. For example, the Ugandan Electricity Act appears to provide for a rural electrification agency resembling the conventional rural electrification programmes which have been unsuccessful in other countries, such as Kenya and Zambia.

Consequently, nearly 6 years after the establishment of the Ugandan rural electrification agency through the aforementioned Act, the agency has not had any significant impact on rural electrification levels. By contrast, in Zimbabwe, the establishment of the Rural Electrification Agency (REA) has accelerated rural electrification. For example, in only 3 years, rural electrification levels in Zimbabwe have increased from 20% in 2001 to 25% in 2004 (Mangwengwende, 2005; Kayo, 2005).

The sequence of power sector reform measures in a number of African countries appears to have been detrimental to electrification of the poor, particularly in rural areas. With the exception of South Africa and Zimbabwe, initiatives aimed at increasing rural electrification in a several countries were started at the end of the reform process. By contrast, other developing countries such as Thailand, Bangladesh and Philippines, initiated reforms after establishing structures and mechanisms for increased electrification, particularly of rural areas, before embarking on large-scale privatization (AIT, 2003; Sihag, Chaurey and Sihag, 2003). Eritrea is reported to be in the process of adopting rural electrification structures such as those in the aforementioned Asian countries on a pilot basis (Habtetsion, 2005).

Preliminary assessments indicate that reforms have resulted in increasing tariffs, and a reduction in cross-subsidies, in order to attract private investors in electricity generation and distribution. Table 26 shows recent tariff increases in selected countries in the region.

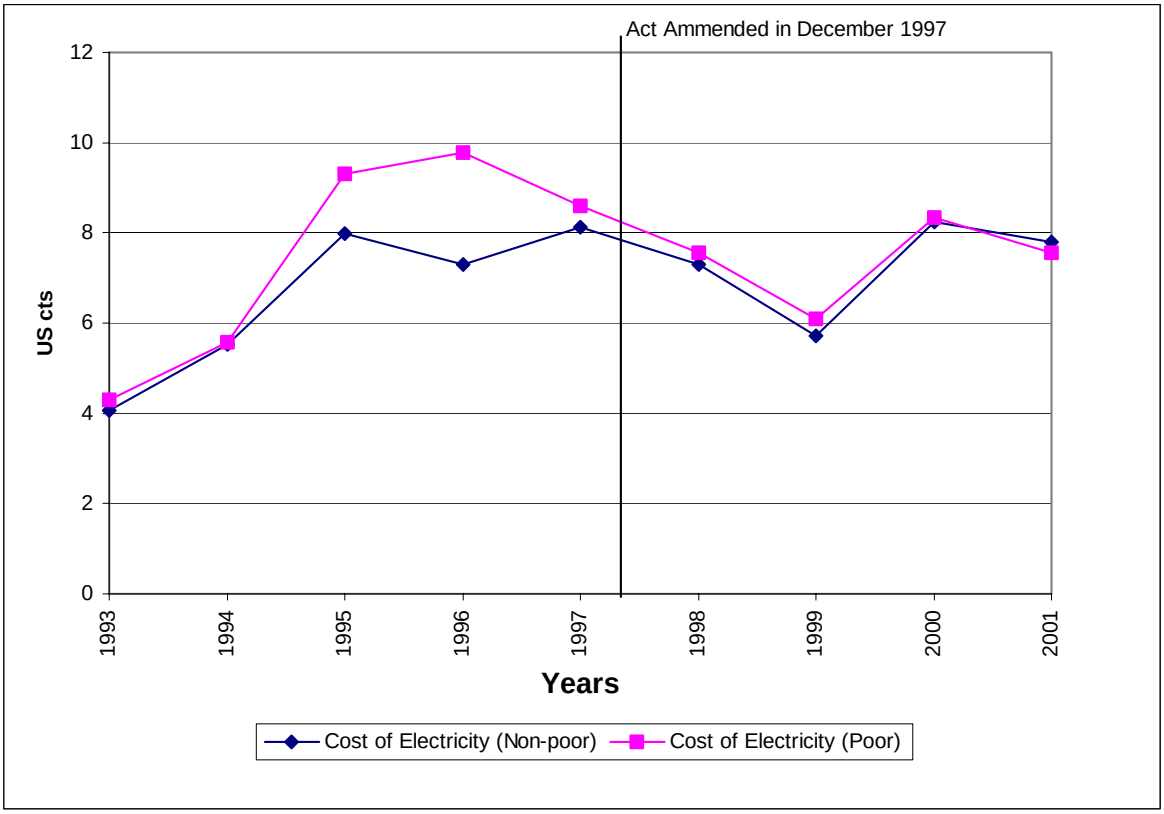
Table 26: Recent Tariff Increases

Country	Average Tariff Increase	Year of Tariff Review	Reason for Tariff Review
Ghana	326 %	1998	General tariff review
Uganda	56 %	2001	General tariff review
Malawi	35%	2000	Effect of foreign exchange adjustment
Kenya	25 %	1999	General tariff review
Ethiopia	26 %	1998	General tariff review
Cameroon	7.5%	2004	Annual tariff review
S. Africa	5.5 %	2001	Annual tariff review

Sources: Gboney, 2001; AFREPREN/FWD, 2001a; FT Energy, 2000c; Nyoike and Okech, 2001; Teferra, 2001; UEDCL, 2001; NER, 2000; NER, 2001.

Tariff increases associated with tariff reforms render electricity too expensive for micro and small businesses to afford. For households, tariff increases have resulted in the poor facing similar charges as the non-poor in some countries (see Figure 28).

Figure 28: Cost of Electricity to the End user in Kenya15



Source: *Computed using data from KPLC, 1992; 1997; 2001/2002; Kinuthia, 2003*

In some cases, increased electricity tariffs may have contributed to disconnections (including on a voluntary basis) among the rural poor. One such example is reported in Ghana where, in spite of making a remarkable increment in rural electrification levels, there is some anecdotal evidence that many rural households have discontinued the use of electricity due to their inability to service their electricity bill - partly attributed to the increase in the cost of electricity (World Bank, 2005).

In other countries, such as in Zimbabwe, there is the possibility of removal of subsidies from electricity tariffs. However, according to a study on electricity expenditure in urban areas (Dube, 2003), poor households spent a higher proportion of their income on electricity than non-poor households (Table 27). Based on electricity consumption patterns and the available subsidies to domestic consumers, it was observed in the study that the removal of subsidies would negatively affect the poor. The study shows that the removal of subsidies would result in an increase in the share of electricity expenditure in total household income by 41 per cent for the non-poor, 87 per cent for the moderately poor and 77 per cent for the extremely poor (Table 28).

[15] The end-user cost of electricity takes into account inflation at constant 1995 prices and foreign exchange losses.

Table 27: Electricity Consumption Patterns of Urban Households

Household Category	Electricity consumption (kW)	Monthly cost as % of income
All households	426	6.4
Non-poor households	574	4.6
All-poor households	335	7.6
Moderately poor households	350	5.2
Extremely poor households	302	10.4

Adapted from Dube (2003).

Table 28: Significance of Electricity Subsidies

Household Category	Electricity Cost Without Subsidy (ZBD)	Subsidy Amount (ZBD)	Subsidy as % of Energy Expenditure	Subsidy as % of Total Income
All households	1,695	681	67	4
Non-poor households	2,285	662	41	2
All poor households	1,333	600	84	7
Moderately poor households	1,393	666	87	6
Extremely poor households	1,202	527	77	8

Source: Adapted from Dube (2003).

Box 3

The Republic of Mali has one of the highest electricity tariffs in West Africa, notably for the Class 1 bracket (0 – 50 kWh per month), while the Class 2 and 3 brackets (51 – 100 kWh), are exempted from the VAT and other regulatory royalties. The normal connection fee depends on the type of meter, the power supplied and electrical consumption. For a single cable, 5 amperes meter, the subscription fee should have been US$ 8.50 in 2002. In reality, however, the actual fee demanded from a customer is in the order of US$ 166.60, irrespective of the customer's consumption bracket. This can be explained by the fact that, in addition to the subscription fee for drawing electricity from the electrical grid, the customer (who receives no subsidy whatsoever) also has to pay for the materials used in connecting him to the electric grid. When one compares these fees with income and poverty levels in Mali, with a net annual national per capita income of around US$ 305. This situation has left some analysts wondering whether the poor have not been further marginalized by on-going electricity access reforms.

Another important development with macro-economic implications is the fact that, in many countries in the region, power sector reform appear to have marginalized local private investment in the power sector. Current trends seem to indicate that, in the medium term, the exit of the state from the electricity industry would effectively hand over the entire electricity industry to non-national operators. In the long-term, this may be an unsustainable arrangement. Without significant local involvement, it is possible that reforms may be reversed in the future (as already witnessed in Senegal and Mali) mainly because there would be no significant local stakeholder group. In addition, a well-thought-through strategy for local participation could provide the basis for developing a robust local private electricity industry. This may assist in reversing the drastic de-industrialisation of the region that has taken place over the last two decades.

Local private participation, especially in IPPs, has mainly been hampered by the emphasis on large-scale investment. The total capacity of IPPs (both implemented and proposed) is greater than the prevailing installed capacity (largely from the state-owned utility), which is an indication of heavy emphasis on large-scale investments. However, there are examples in Zimbabwe and Mauritius that indicate that potential exists for local private investment in the power sector especially using small-hydro, wind and bagasse-based cogeneration and as long as the entry requirements are designed to accommodate local investors.

To sum up, available data and information indicates that, among the countries covered in this study, very little electrification of the poor is taking place. Based on current trends, electrification for the poor is unlikely to take place in the foreseeable future. In addition, the current reforms in most countries do not seem to provide special incentives for the electrification of the poor. The poor also appear to be paying higher charges (certainly not significantly lower) for electricity than the non-poor, while the non-poor largely captures subsidies meant for the poor. Consequently, only a drastic transformation f power sector reforms could improve the situation and lead to greater electrification of the poor.

The foregoing discussion highlights key negative economic impacts that reforms appear to have had on the poor. However, not all forms of reforms have been detrimental, especially to the electrification of the poor[16]. Reforms in several African countries have produced some benefits especially for the poor. The following section highlights these benefits.

[16] Some of the reforms with anticipated positive impacts on the poor are yet to be implemented. For example, a number of the rural electrification agencies stipulated in the amended Electricity Acts are not yet operational.

4.2 Socio-economic Benefits of Power Sector Reforms

Access to low-cost electricity services can deliver significant economic benefits[17] to sub-Saharan Africa especially among the rural poor. Notable benefits include (Clancy and Redeby, 2000; IEA, 2002):

- Enhanced income from agricultural products due to the establishment of agro-processing industries18 attracted by the availability of electricity in rural areas. Proximity to these industries encourages growth in agricultural production, which in turn increases the incomes of the rural poor.

- Rural electrification enables preservation of agricultural produce. This improves the income levels of the poor as access to electricity reduces post-harvest losses. For fishing communities, access to electricity can dramatically reduce volumes of spoilt fish as well as allow storage of fish for sale at times when prices are high.

- Electricity in rural areas enables support services such as research laboratories and artificial insemination to be brought closer to the poor.

- Electrification of rural trading centres creates opportunities for job creation and income generation activities. For example, electrification enables establishment of welding, battery charging and electronics repair businesses. In addition, electrified trading centres can extend their hours of business thereby providing opportunities for the rural poor to increase their income.

Arguably, the majority of the rural poor may not directly benefit from electrification as they not afford the cost of connection to the grid. However, they are likely to indirectly benefit from electricity services through enhanced services obtained from rural market centres, schools, health centres, water pumping and Government administration offices, community participation is essential as it ensures ownership and commitment. They may also benefit from better returns on the cash crops that they produce. For example, in Kenya, the European Union recently concluded a project for electrifying rural coffee factories to minimize the cost of processing coffee. It is anticipated that by reducing the cost of coffee processing, the farmers (most of them who are relatively poor) will benefit from higher returns.

[17] In Namibia, a study noted that in newly electrified areas, small businesses were rapidly established (Clark, et al, 2005).

[18] Examples include coffee factories, tea factories, food processing plants and milk coolers. Proximity to milk coolers, for instance, could nearly double the income of the rural poor.

Box 4

A recent survey conducted in Kenya indicates that the electrification of the rural areas have numerous benefits to the small and micro enterprises. The following are potential benefits of electricity services to the rural poor identified during the aforementioned survey:

- Value addition to agricultural and dairy products: Reduced post-harvest loses and improved processing of grains, milk, fish and fruits through wider use of electricity-powered machinery for grinding, cooling, and heating.
- Increased household incomes due to income generation activities that can be undertaken beyond daylight hours when electricity becomes available
- Small-scale businesses like hair-cutting, welding, battery charging that use electricity create more employment and reduce time wasted traveling long distances to access these services.
- Improved health and sanitation through provision of water pumped with electricity, refrigeration for health clinics, longer hours available for surgical operations and better access to more advanced health facilities.
- Mortuary services to be provided to local health facilities that will allow local communities adhere to their customs and cultures of honouring their dead for a number of days before they are buried.
- Medical and educational personnel are attracted to work and stay in the rural areas because of availability of electricity and associated modern services and communication facilities.
- Improved communication and educational media through electricity-powered radios, mobile phones and ICT.
- School lighting to allow evening classes.
- Youths enjoying entertainment in Youth Centres powered with electricity.
- Electricity-driven water pumps allow women and girls to have more time to undertake income generating activities and study because less time will now be spent fetching water from long distances.
- Electric-powered public lighting in market places, social centers and compounds improves security and reduces crime rates.
- Better safety through replacement of kerosene lamps/ wicks and candles that cause burns, accidents, house fires with safer electric lighting.

In South Africa, many of the rural population who cannot afford electricity can access the electricity services as externalities. Electrification of clinics and schools has resulted in significant benefits for communities, ranging from improved health-care service provision, battery charging and enabling schools to be involved in evening adult education as well as improving the efficiency of school

operations, through use of equipment such as photocopiers and computers, longer study hour for children that has been indicated to have greater impact on their performance. In certain cases electric street lighting may have contributed to reduced crime levels

An important positive outcome of power sector reforms is the establishment of Rural Electrification Agencies and associated Rural Electrification Funds. These have already begun delivering benefits to the rural areas in some countries. For example, in Zimbabwe, the Rural Electrification Agency (REA) established in 2002 has designed a program to expand rural electrification dubbed the Accelerated Rural Electrification Program with End Use Infrastructure Development. The programme covers the eight regions in Zimbabwe.

This programme provides a 100% electrification capital subsidy for the electrification of rural institutions that serve communities. Other electrification projects are given a 50% electrification capital subsidy and favourable repayment terms. The Accelerated Rural Electrification Program with End Use Infrastructure has made remarkable progress from the time of its inception to present. Table 29 below highlights the progress that has been made so far.

Table 29: Rural Electrification by REA - Case of Zimbabwe (Since 2002)

Type of Institution	Total Electrified to date
Schools	1,625
Business Centres	718
Rural Health Centres	358
Government Extension Offices	235
Chiefs Homesteads	148
Small Scale Farms	453
Villages	369
Irrigation Schemes	85
Borehole/Dam Points	47
Others	191
Total	4,229

Source: National Electrification Statistics REA 2005

It can be seen that REA under the Accelerated Rural Electrification Program with End Use Infrastructure, has managed to electrify 4,229 institutions within a period of less than three years following the introduction of reforms. The benefits of the rural electrification in Zimbabwe are highlighted below.

Table 30: Benefits of the Rural Electrification in Zimbabwe

Institution	Benefits
Rural schools	• Improved education facilities such as lighting and clean water • Richer curriculum • ICT facilities • Better quality of life for teachers
Rural Clinics	• Improved water and sanitation • Refrigeration • Improved health facilities includes X-rays and diagnostic machines etc • Reduced referrals of patients
Irrigation schemes	• Increase in productivity in dry lands • Increase in crop variety
Rural Business Centres	• Increase in income generating projects • Increase in social services to the rural communities e.g. banks, recreational facilities etc
Villages	• Improved lighting facilities enabling extension of working hours • Where electricity is used for cooking there is a clean form of energy and reduction in deforestation • Increase income generating projects.

Source: Kayo, 2005

While increased access to electricity especially in rural areas is important, its affordability is widely recognized as an important impetus to economic development. Rural sub-Saharan Africa and low-income urban areas lack significant economic development not only due to limited access to electricity but also due to the fact that where access is not an impediment, its effective use in wealth creation is hampered by high electricity tariffs, especially during the post reforms period. In some of the countries covered in the study, reforms have made an attempt to address this issue. For example, in Zimbabwe, Kenya and Uganda, tariff reforms have ensured electricity is affordable among the poor by having a lifeline tariff for the first 50 kWh of electricity consumption. In South Africa, the poor also enjoy up to 50 kWh of free electricity every month.

Box 5

The South African Government has introduced a subsidy which supplies 20-50kWh of free electricity to the poor in selected areas seems to have had a more direct impact on the poor. It had some positive impact on poverty alleviation following the reduction in electricity expenditure. Consumers not connected to the electricity grid, such as those using solar systems, are also allocated up to R48 per month to offset the operational and maintenance costs of the systems.

The subsidy for the poor connected to the grid has started showing positive signs although the programme is still in its early stages. The results of an evaluation by the University of Cape Town show an increase in average monthly saving in household income of about ZAR 21.0 per person per month (UCT, 2002), a slight saving but one which can be significant in communities with limited monetary transactions. In some communities, it has been reported that about 30 per cent of the households have added lights in previously non-electrified rooms. It is also reported that some households started using appliances they owned but were not able to use before the programme was implemented. Responses to queries about the benefits of the electricity subsidy have been as follows:

- Able to use more electric light;
- Able to cook more efficiently;
- Able to use electricity for the whole month;
- Able to use more electrical appliances;
- Schoolchildren can study for longer periods with better lighting;
- Able to use radio and television for longer periods;
- Able to spend money saved from electricity on food;
- Reduced indoor pollution due to fuel substitution; and
- Reduced anxiety about electricity being an expensive source of energy.

However, this is a very recent development and additional studies may be required to assess the feasibility of the subsidy due to the significance of its impact on the Government's coffers – the programme at present is costing the South African Government about ZAR 630 million annually.

Other significant benefits to the poor include reduction of upfront costs of electrification as well as the institution of levies on urban electricity consumers to finance rural electrification. However, a drawback for low-income electricity consumers with no pre-payment meters is that tariff reforms have introduced penalties for late payments as well as reconnection fees whenever the consumer is disconnected for non-payment.

In Zimbabwe, South Africa, Malawi, Kenya and Uganda, the electricity utilities have reduced the upfront costs to enable the poor afford connection especially for productive uses. In Zimbabwe, South Africa and Malawi, use of low cost electrification options such as load limiters and pre-payment meters has led to significant electrification of the poor especially those in peri-urban areas. In addition, in most of the countries covered in the study with Rural Electrification Agencies (or agencies pending) such as in Kenya, Uganda, Zambia, Zimbabwe, Mali, Cameroon, Burkina Faso and Senegal, reforms have led to the urban consumers being levied to finance the implementation of rural electrification.

In some countries, subsidies on electrification infrastructure as well as cross-subsidies on electricity consumption have been introduced. Reforms, through the amended Electricity Acts, have provided for the establishment of Rural Electrification Funds to subsidize the cost of grid extension to the rural areas. In Senegal, cross-subsidies have been introduced to minimise the cost of electricity among domestic consumers especially the poor (Sarr, *et al*., 2003).

At the macro-economic level, while there is insufficient data to analyse the direct impact of power sector reforms on the economy, for example, on GDP, reforms might have indirectly impacted on the economy through enhanced power supply. In Kenya and Ghana, for example, IPPs have contributed to increased generation capacity which has reduced load shedding and power shortages in the industrial sector. Furthermore, reforms have contributed to job creation especially during the installation of IPPs and to a lesser extent in their operation. In addition, during commercialization of the electricity utilities, some of the non-core activities have been outsourced to the private sector thereby providing additional opportunities for job creation. Where utility employees were inevitably laid-off, some utilities such as those in Zimbabwe and Kenya encouraged the affected former employees to form companies to compete for the outsourced activities.

Another important development with macro-economic benefits is that reforms have contributed to the profitability of electricity utilities. This is the case in Uganda, Zimbabwe, Kenya and Ghana. Profitability of the utilities is crucial for sustainability of the utilities. It also enables Governments to spend available resources on other social and economic needs such as on health, education and infrastructure. The Zimbabwean case provides a good illustration of how reforms contributed to the utility's turnaround in financial performance (see Table 31).

Table 31: ZESA's Performance Before & After Reform

Indicator	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Self-financing ratio	-112.0	-65.0	-102.0	-28.0	27.0	31.0	47.0	37.6	37.6	40.0
Debtor days	72	74	85	99	61	50	56	37	32	32

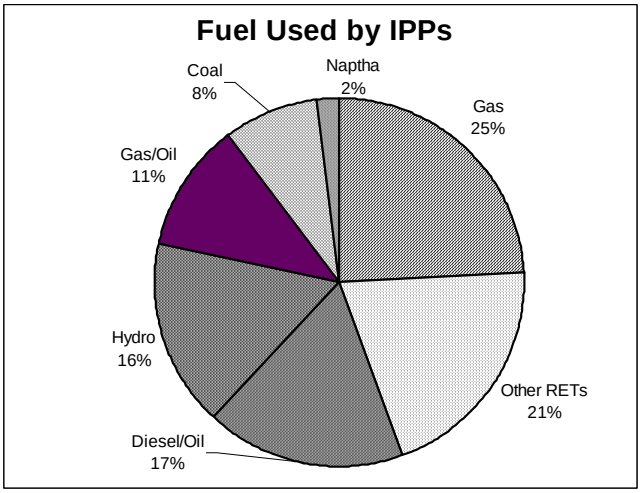
Note: 1992-1993 = Reform period for the utility

Source: ZESA, 1997; Mapako, 1998; Kayo, 2001

Chapter 5: Environmental Impacts of Power Sector Reforms

One of the drivers of power sector reforms is to increase generation capacity through private investment. This means allowing Independent Power Producers (IPPs) to generate electricity. This development has a significant environmental implication, notably: Prior to reforms, in the countries covered in this study, most of the electricity generation came from non-fossil fuel-based sources, mainly hydro. However, in this proportion is rapidly decreasing because most of the IPPs (implemented and proposed) are fossil fuel-based as shown in Figure 29. For example, recent estimates by AFREPREN show that only 37% of the total installed capacity of all the implemented and planned IPP investments are using environmentally friendly electricity generation options such as hydro, wind, bagasse-based cogeneration and geothermal (see Figure 29):

Figure 29: Proportion of Installed Capacity of IPPs By Fuel Used in Africa (2002)



Sources: Karekezi and Mutiso, 1999; Daniel, 2000a; Daniel,, 2000b; Daniel, 2001a; Daniel, 2001b; Daniel, 2001c; Daniel, 2001d; Marks,2002a; Marks,2002b; Marks,2002c; Marks,2002d; Marks,2002e; Marks,2002f; Marks,2002g; Marks,2002h; Marks,2002i; Marks,2002j; Marks,2002k; Marks,2002l.

Promoting proven environmentally friendly electricity generation options such as hydro, wind, bagasse-based cogeneration and geothermal can have a positive impact on the sustainability of the power sector.

First and foremost, they are modular in nature (i.e. they can be developed incrementally) and the consequent low and progressive nature of investment requirements make them particularly suitable for capital-constrained African countries. This implies that, if well designed, their implementation can be planned such that their development is in tandem with the growth in electricity demand - thereby minimizing incidences of power shortfalls and the attendant rationing of electricity supply.

Secondly, the significant growth in fossil fuel-based IPPs in numerous sub-Saharan African countries is characterised by an increase in the levels of imports of petroleum products - which account for a significant proportion of export earnings. Such high imports make countries in the region vulnerable to external oil price shocks, fluctuations in the exchange rates of hard currencies and have adverse implications for balance of payments as well as the associated tariff increments. Sustainable electricity generation options such as hydro, wind, bagasse-based cogeneration and geothermal could play a vital role in minimizing fuel imports by providing an alternative to fossil fuel-based electricity - thereby minimizing tariff increases. They also offer diversification in electricity generation, thus strengthening energy security. Furthermore, countries with natural gas reserves such as Cote d'Ivoire, Tanzania and Rwanda, IPPs should rely on this energy source which is environmentally-friendly.

Thirdly, diversification of electricity generation options is a clear and present threat to the sustainability of the power sector. In recent years, large-scale energy sources such as hydropower have proven unreliable. This is because hydropower is dependent on rainfall, and is therefore vulnerable to drought. Many sub-Saharan African countries have experienced serious droughts in the past, which have affected hydropower generation (see Table 32). Droughts are likely to become more frequent in the future.

Table 32: Drought and its effect on hydropower generation

Country	Drought period	Consequences
Uganda	2004/2005	Reduction in water levels at Lake Victoria resulting in reduction in hydro-power generation by 50MW
Kenya	1992	Failure of rains led to power rationing in April–May 1992
Kenya	1998–2001	Massive drought decreased hydro generation (25% in 2000), which had to be replaced by more expensive fuel-based generation. Power rationing in 1999–2001.

Country	Drought period	Consequences
Lesotho	1992	Hydro operation limited to 6 months, leading to 20% reduction compared to 1991.
Malawi	1997–1998	Engineering operations affected by drought. Amount of hydro energy generated was 6% less than in years of normal rainfall.
Mauritius	1999	Massive drought led to70% drop in normal annual production of electricity.
Tanzania	1997	The Mtera dam reached its lowest ever level resulting in a 17% drop in hydro generation, use of thermal generation to meet the shortfall, and power rationing.
Zambia	1992	Poor rainfall resulted in a 35% reduction in hydro generation in relation to the previous year.
Zimbabwe	1993	Drought led to a drop of over 9% in energy production compared to 1992.

Sources*:* AFREPREN 2004; KPLC, 1999, 2001; LEC, 1993; CEB, 1999; ESCOM, 1998; TANESCO, 1997; ZESCO, 1992; ZESCO, 1993; ZESA, 1993; KenGen, 2000, www.irinnews.org.

However, wind, geothermal and bagasse-based cogeneration[19] energy source are not reliant on rainfall and can therefore reduce the weather related risks associated with heavy reliance on hydroelectric schemes. For instance, in Kenya, during the drought period of 1998–2000, Kenya's geothermal plants offered almost 100 per cent availability to cover base load deficits regardless of prevailing weather conditions while bagasse-based cogeneration was used to meet the power deficits caused by drought in Mauritius in 1999.

Finally, hydro, wind, bagasse-based cogeneration and geothermal plants tend to be located in remote rural areas, some of which have not access to electricity supplied by distribution utilities. Therefore, encouraging investment in these energy options appears to be an attractive option as it enhances opportunities for rural electrification.

A significant result of power sector reforms is the liberalization of generation which has in turn opened up regional electricity trading. Consequently, a few IPPs have shown interest in constructing large-scale hydropower dams. This development has met severe resistance from environmental lobby groups citing potential environmental destruction associated with the proposed dams. Notable hydropower dams that have attracted significant attention of the aforementioned

[19] However, if drought affects the growth of sugarcane it may in turn affect the level of electricity generation using cogeneration.

lobby groups are the proposed 200 MW Bujagali Dam by AES in Uganda and the 40,000 MW Inga Megadam[20] in the Democratic Republic of Congo which Eskom hopes to take lead in mobilizing the financial investment (Vasagar, 2005).

However, the gap between the environmental lobby groups and hydropower developers appears to be reducing. There now appears to be a consensus between environmental lobby groups and developers that the key concern is whether specific dams are well designed to minimize negative environmental impacts. For example, the Inga Megadam can be developed with minimum environmental impact. This project may, for instance, be very attractive given its potentially low electricity generation costs compared to fossil fuel-based generation. Furthermore, refurbishment of existing hydropower plants can be undertaken to return them to full production without any significant environmental impacts.

On the other hand, there are also a number of IPP power plants that are environmentally-friendly. Notable examples include Ormat Inc. which operates a 100 MW geothermal plant (still under development) in Kenya and at 70 MW cogeneration plant operated by Compagnie Thermique de Belle Vue Limitee' in Mauritius. Both power plants have very attractive environmental characteristics. For example, the geothermal power plant in Kenya incorporates a hi-tech air-cooling and the re-injection system of all geothermal fluid thereby avoiding an estimated 200,000 tons of CO2 emissions per year (Partnerships Central, undated). In Mauritius, the use of the cogeneration power plant is estimated to save about 45,000 tons of CO_2 emissions each year (GEF, 2001).

In overall terms, one of the most significant environment-related outcomes of power sector reform is the amendment of the Electricity Acts in several African countries to provide for Environmental Impact Assessments (EIAs). Prior to the aforementioned amendments, new power generation installations were not required to conduct environmental impact assessments before carrying out new installations.

The requirements of the EIAs include the identification of potential environmental and social problems and the design of appropriate mitigation measures. Most African countries have instituted environmental policies (Table 33). This has had the effect of incorporating environmental and social costs which had hitherto been ignored to the disadvantage of environmentally benign sources. In the post-reform period, planners have devised means of incorporating the social and environmental costs in the planning process to ensure that these costs are incorporated in the project costs and

[20] Due to its enormous size, this project is like to be a state-led initiative. It may, therefore, not be a conventional IPP but is likely to involve private investors and have significant characteristics of an IPP.

ultimately by the consumers along the production and consumption chain. It can, therefore, be argued that reforms have partially contributed to the increase in the cost of power generation by incorporating social environmental costs which had previously been ignored by the power sector. This increase is associated with the tariff reforms discussed earlier in this document.

Table 33: The Status of EIA Policies Laws and Guidelines in the Region[21]

Country	EIA policy	Specific EIA (or framework) law	Regulatory Institution	Number of Staff	No. of EIA Completed
Malawi	National Environmental Policy, 1996	Environmental Management Act, No. 23 of 1996	Ministry of Natural Resources and environment Affairs	3 professionals	82 EIAs between 1998 and 2002 in Infrastructure (including power), tourism and water projects)
Namibia	National Environmental Policy, 1995	Environmental management Bill in progress	EIA Unit, Directorate of Environmental Affairs, Ministry of Environment and Tourism	1 professional, 1 donor funded assistant	82 EIAs completed between 1980 to 2002
Tanzania	National Environmental Policy, 1997	Environmental Management Bill in progress	National Environmental Management Council (Vice President's Office) administers EIA process, Local authorities are mandated to implement environmental policies and regulations	Unknown	An estimated 26 EIAs have been completed since 1980.

[21] It is important to note that most of the EIA policies, laws and guidelines in the region were enacted prior to power sector reforms and may therefore not have captured essential elements required for carrying out EIAs for the power sector.

Country	EIA policy	Specific EIA (or framework) law	Regulatory Institution	Number of Staff	No. of EIA Completed
Zambia	National Conservation Strategy	Environmental protection and Control Act, No. 12 of 1990, and amended in Act No. 13 of 1994Regulations of 1997	EIA Directorate, Environmental Council of Zambia	5 professionals	Since 1997, 134 projects briefs have been completed, of which 23 resulted in full EIAs in mining, power and infrastructure
Zimbabwe	Environmental Impact Assessment Policy, 1994 National Conservation Strategy, 1987	Environmental Management Act, 2002	EIA Unit in the Department of Natural Resources, Environmental Management Agency being currently put in place	In the Department of Natural Resources 1officer and 8 regional assistants In the new Agency numbers not yet known	197 EIAs have been conducted since 1995

***Source**: The Southern Africa Institute of Environmental Assessment*

On the other hand, amendments to the Electricity Acts have contributed to more environmentally friendly electricity generation. This well illustrated in the case of Kenya's (see following case study) geothermal installations by comparing the so-called Olkaria I - a pre-reform installation with Olkaria II and III which are post-reform installations.

Case Study: Kenya

The environmental impacts of using geothermal power that are of concern include: air quality, water pollution, land disturbance, aesthetic or visual impacts, and noise emissions. Being within the Hale's Gate National Park (HGNP) means that the issue of human disturbance or resettlement did not arise. However, with regard to disturbance to the fauna and flora, the experience from Olkaria I showed a minimal impact on the flora provided any disturbed sites were restored to as near their

original states as possible. Olkaria II and III have made major improvements in respect of possible disturbance to the flora by piping and re-injecting all waste water rather than using open ditches as was the case with Olkaria I. This new approach prevents new vegetation from colonising the neighbouring areas. This issue is discussed further in the following paragraph.

The visual impacts associated with the power plant itself and the steam gathering pipes, of which there are considerable lengths, have been minimised by using a colour scheme that blends in with the surroundings. The purpose of this is to maintain the natural beauty of the Park. The EIA report indicates that this has not affected tourist activities in HGNP adversely. The socio-economic and environmental impact in this regard can therefore be considered neutral.
With regard to air quality, the gaseous emissions from geothermal power production that are of interest in this context are mainly carbon dioxide - CO_2 (96%); hydrogen sulphide - H_2S (~4%) and tiny quantities of hydrogen - H_2, methane - CH_4 and nitrogen - N_2. The most hazardous of these is hydrogen sulphide of which the ground level concentrations in the Olkaria area have been determined in the EIA for the Olkaria II and III project to be below hazardous levels for workers and the local population. Further the design for Olkaria II and III projects will result in better dispersion of the gaseous emissions than was the case with Olkaria I.

The disposal of residual waters for Olkaria II and III project is by re-injection through re-injection wells into the geothermal reservoir, which is a vast improvement over disposal into gullies and natural water ways as practiced in the Olkaria I project. Re-injection ensures that the spent brine does not come into contact with surface water consumed by humans and livestock; further it cannot alter the natural composition of surface waters and upset the natural balance of the local eco-system. A further advantage of re-injection is the recharge of the reservoir and maintenance of reservoir pressure and steam rates over a longer period of time.

These two cases serve to illustrate the major departure in the way electric power is produced and supplied in the two eras: with the Olkaria I project illustrating pre-reform practices and Olkaria II and III projects illustrating post-reform practices. It is apparent that the reform process has had a markedly different and positive impact on the environment.

Case Study: Cameroon

The milestone of the Cameroonian environmental policy is the 96/12 environmental law, enacted in August 1996 (see Republic of Cameroon, 1996). It is in this law (article 17) that requirements for an environmental impact assessment (EIA) are established for every important project. The Ministry of Environment and Forestry (MINEF) is responsible for the environment and the application of this

law. However, in the 1999 decree creating ARSEL, it is explicitly mentioned that the regulatory agency has the responsibility to monitor the application of environmental regulation (article 3). In practice, this means that ARSEL has the responsibility to ensure that EIAs are prepared for all new power projects.

Since few new projects have been developed after the reform, its environmental impact can only be limited. The following discussion reviews the two main power projects that have been implemented since 2001; Limbé heavy fuel oil 85 MW power project (led by AES-Sonel); and, the Lom-Pangar 51 MW hydroelectric dam power project (led by the Government of Cameroon).

The Limbé power plant is the first major addition to the generation capacity of Cameroon since the 1996 environmental law and 2001 privatization. AES-Sonel hired the American consultants Black & Veatch to undertake the EIAs and write the environmental impact statement (EIS) for this project. The EIS was completed in 2003, see AES-Sonel (2003a) for the main text and AES-Sonel (2003b) for the appendices.[22] The EIS was made according to guidelines of potential lenders for this project: the World Bank's IFC, the European Investment Bank (EIB), Proparco, EAIF and FMO. Eventually, EAIF and the FMO financed the Limbé power plant project, commissioned in September 2004.

The EIS for the Limbé power plant is an exhaustive 288-page document, with almost equally long appendices, covering the background of the project, its possible alternatives, the baseline conditions (social, natural and physical environment), the technical description of the project itself, the public consultations undertaken, the impacts and mitigation measures for the construction and operations of the project, its decommissioning and the proposed environmental action plan.

The Limbe power plant is hailed for its contribution to reducing Cameroon's dependence on hydroelectric power. The plant is also considered an exceptionally 'clean' oil-fired power plant as it meets European environmental requirements. The exhaust stack has even been elevated to comply with these European regulations (FMO, undated).

Plans are underway to construct a gas-fired power plant. The gas-fired thermal power plant be very attractive as it will contribute to reducing gas flaring if the gas associated with oil production is used.

[22] Surprisingly, these documents (AES-Sonel, 2003a and b) are not available on AES-Sonel website nor on any government of Cameroon website, but on the World Bank Documents & Reports website (www-wds.worldbank.org).

For the Lom-Pangar 51 MW hydroelectric dam power project, the Government of Cameroon acts as the promoter of the project. A consortium of consulting firms (ISL-OREADE-BRECHE-SOGREAH) is in charge of the EIA, under the direction of an independent experts panel. The panel is composed of international environmental and hydroelectric experts and ensures the reliability of the EIA. The EIA is made to satisfy the requirements of the 1996 environmental law, of the World Commission on Dams and of potential lenders such as the World Bank, European Union development agencies, the African Development Bank, etc. (Independent Expert Panel, 2004:58). The EIA will cover equivalent issues to the ones covered in the Limbé EIA.

ARSEL and the World Conservation Union (IUCN) are technical partners in this project that started in December 2003, while financial partners are the Government of Cameroon and the French and German development agencies (UICN-BRAC, 2005). The construction of the dam is set to start in 2006, for operations starting in 2010. However, ARSEL has acquired limited experience in energy regulation since its creation in 1999 and has even less exposure to environmental issues in the energy sector. This weaks the regulator's ability to enforce environmental regulation.

Chapter 6: Key Findings

Based on the discussion and analysis presented in the foregoing chapters of this report, several findings emerge. One of the key findings is that power reforms were not explicitly designed to ensure sustainability of the power sector. It is, therefore, not surprising that reforms have marginally contributed to the sustainability of the power sector. Reform were primarily designed to bridge short term generation shortfalls and enhance the financial health of state-owned power utilities. However, assessing the socio-economic and environmental impacts of reforms - the two key factors of the sector's sustainability - it largely appears that reforms have not produced significant positive outcomes, as indicated in the following discussion.

This study regarded socio-economic impacts of reforms (especially electrification of the poor) as an important indicator of the power sector's sustainability. In overall terms, socio-economic impacts of reforms on the poor appear to be negative or neutral. This is because, first and foremost, electrification of the poor was not significantly addressed in the reform process and was, in several cases, almost an afterthought with the exception of Cote d'Ivoire, Cameroon, Malawi, Burkina Faso, Senegal, Zimbabwe, South Africa and Mauritius. As a result, electrification levels of the poor (especially in rural areas) in many reforming sub-Saharan countries, except in the aforementioned countries, have either stagnated or declined altogether.

However, in urban areas, reforms appear to hold some benefits for the urban poor. In countries where there exists a separate Electrification Agency such as in Uganda, the advent of independent power distributors appears to provide an opportunity for the electrification of the often forgotten urban poor as in such a case IPDs' mandate includes the expansion of electricity services to the peri-urban.

Secondly, while reforms have led to the establishment of rural electrification funds and boards, these developments have not helped to increase electrification levels. In part, this is because the rural electrification funds and boards have not provided effective and innovative mechanisms that would ensure they achieved their objectives. Their design appears to have largely replicated that of past (and failed) mechanisms. Consequently, the rural electrification funds and boards have very little to show in terms of electrification of the poor. This assertion is well demonstrated by the comparison between Uganda and Zimbabwe where in Uganda no significant progress in terms of electrification of the poor has been reported 6 years after the advent of the Rural Electrification Authority while in Zimbabwe, in only 3 years, rural electrification levels rose from 20% to 25%.

Another important finding with regard to the impact of socio-economic impact of reforms on the poor is the increase in the cost of electricity and the associated reduction or removal of subsidies for the poor. Tariff increases were motivated by the desire to improve the financial health of the state-owned utilities as well as to attract private investors. While these are desirable attributes as far as the sustainability of the power sector is concerned, however, placing a heavy financial burden on the poor to the extent of leading to disconnections (eg. in Ghana) is neither desirable nor does it contribute to a sustainable power sector. Furthermore, with the exception of Malawi, Zimbabwe and South Africa, there is little evidence of power utilities introducing low cost electrification options at a significant scale to minimize the cost of electricity among the poor.

It is also important to note that, in part, the involvement of IPPs has led to aforementioned increase in tariffs. Based on the experiences of Kenya and Ghana, this is mainly due to three key reasons: Firstly, most of the IPPs use fossil-fuel based electricity generation plants. Therefore, the high and rising cost of fuel has been transferred to the consumers. Secondly, a significant number of IPPs have been invited in on an emergency basis thereby escalating the cost. Thirdly, the licenses and Power Purchase Agreements (PPAs) issued to the IPPs appear to have a short time span leaving IPPs with no choice but to ensure that they recover their investment costs and make attractive returns within the limited time. In Kenya, for instance, the selling price of electricity from one IPP fell by about a half when the license and PPA was renewed but for a much longer period.

The power systems in the region have over the past few years been overstretched due to a shortfall in generation capacity to match growing demand. The general response to the unfolding crises has been to increase generation capacity by allowing IPPs into the sector. In extreme cases where generation from IPPs has still not been sufficient to meet demand, load shedding has ensued. This has led to significant loss to the economy and has generally pushed up the cost of electricity as electricity generated from IPPs has not been cheap. However, an effective way of reducing the gap between electricity supply and demand is by encouraging efficient use of electricity - an option that has not received adequate attention in the region.

Another key finding is that, in many countries in the region, power sector reform appear to have marginalized local private investment in the power sector. Current trends seem to indicate that, in the medium term, the state is effectively handing over the entire electricity industry to non-national operators. In the long-term, this may be an unsustainable arrangement. In part, local private participation, especially in IPPs, has mainly been hampered by the emphasis on large-scale investment. However, there are examples in Zimbabwe and Mauritius that indicate that potential exists for local private investment in the power sector especially using small-hydro, wind and

bagasse-based cogeneration and as long as the entry requirements are designed to accommodate local investors.

With regard to the financial sustainability of the electricity utilities, reforms appear to have largely met the objective of turning electricity utilities into profitable entities. This is important as it ensures that the resources that previously went into salvaging the utilities are utilized to meet other social and economic needs such as health, education and infrastructure. Furthermore, have reforms also provided for a more sustainable financing mechanism for rural electrification through the introduction of a levy mainly imposed on urban electricity consumers.

The environmental impacts of power sector reforms and the extent to which they have contributed to the sustainability of the power sector are discussed below. One of the key findings is that the amendments of the Electricity Acts have partially contributed to the sustainability of the power sector by ensuring that Environmental Impact Assessments are carried out prior to major electricity generation, transmission and distribution installations. However, the amended Acts are silent on environmentally unfriendly installations that were established prior to the new Electricity Acts.

Another key finding highlighted in this study is the worrisome trend in many countries, except for Zimbabwe, Kenya and Mauritius, whereby the share of IPPs generating electricity from sustainable energy sources such as hydro, solar, wind, geothermal[23] and bagasse-based cogeneration, is declining[24]. If this trend continues unabated, it will not only imply an increase in the level of greenhouse gases emissions from the energy sector in sub-Saharan Africa, it may also lead to an increase in the cost of electricity thus affecting the poor negatively as discussed earlier.

Another key finding is that major concern has been raised over the development of large-scale hydropower plants, especially the proposed Bujagali Dam in Uganda and the Inga Megadam in the Democratic Republic of Congo. Environmental lobby groups in the region have put up a substantial amount of resistance citing potential environmental destruction associated with the proposed dams. However, although environmental lobby groups appear to gradually accept well designed hydropower dams, continued resistance might, in part, affect the sustainability of the hydropower sector.

[23] The most promising geothermal resources are concentrated along the Rift Valley in the eastern African region and may therefore not be applicable to countries in other regions of Africa.

[24] Where favourable wind regime exists, IPPs can also invest in wind farms like in Morocco and Egypt. Small hydro-based IPPs may not be difficult to finance because of they have lower risks than large hydro which has high risks associated with long lead time for project implementation.

Being in charge of regulating the newly reformed power sectors in the respective countries, the performance of the Electricity Regulatory Agencies was assessed. Preliminary findings of this assessment indicate that the regulatory agencies have done little to ensure the sector's sustainability. In part this is attributed to the weakness of the regulatory agencies to enforce the Electricity Act as a result of two key factors: Firstly, the electricity regulatory agencies are relatively new entities and have, therefore, not built significant capacity. Secondly, in some instances, even where capacity exists, the ability of the regulatory agency to perform its duties has been compromised by its lack of the requisite independence as a result of politically motivated appointments of the members of the respective agencies' boards. The fact that limited intervention has been made by the regulatory agencies to protect the poor from negative impacts of the high cost of electricity and ensuring their electrification is a clear indication of the regulatory agencies' disinterest among the poor.

Furthermore, the regulatory agencies have done little to promote an environmentally-sustainable power sector by reviewing electricity generation options. For example, there is no indication of regulatory agencies setting specific targets for the share of electricity generated from renewables energy technologies. In addition, with the exception of Mauritius, the regulatory framework in most of sub-Saharan African countries does not provide for attractive tariffs to sustainable energy generation options such as small-hydro, wind, bagasse-based cogeneration and geothermal.

Chapter 7: Recommendations

Having examined the extent to which reforms have contributed to the sustainability of the power sector in the previous chapter, this section highlights opportunities and options for making the power sector sustainable by focusing on three key issues: Enhancing access to electricity among the poor; Technical Options for Improving Access to the Poor; Ensuring the use of environmentally-sound electricity generation options; and, Addressing gaps and barriers in the legal and regulatory framework.

7.1 Enhancing Access to Electricity among the Poor

The need for enhancing access to electricity among the poor cannot be overemphasized. In sub-Saharan Africa, the poor - especially in rural areas, form the majority of the population. Therefore, access to electricity is likely to widen their scope of income generating opportunities. There several options for enhancing the poor's access to electricity and these are discussed below.

Sequencing reforms: Sub-Saharan African countries whose reforms are not at advanced stages should ensure that they establish structures and mechanisms for increased rural electrification before embarking on large-scale privatization reforms. Evidence from other developing countries indicates that higher levels of access to electricity among the poor, especially in rural areas, have been achieved when rural electrification initiatives precede major market oriented reforms such as privatization.

Linking electrification targets to contract renewals REAs Board Members: The newly formed rural electrification agencies should have specific targets for electrifying the poor. This should be enforced through making the targets as part of the agencies' annual reporting as well as renewal of the contracts of the board members as well as the executive employees of the agencies. A similar system is already in place in Kenya through the newly instituted performance contracts for public institutions including key officials in Ministry of Energy and the Heads of the electricity utilities.

Linking electrification targets to licenses renewals and tariff increments: The electricity regulatory agencies could also enforce the electrification of the poor through linking set targets to issuance of licenses and concessions to electricity distribution utilities. Linking the number of connections to licenses and concessions is critical to ensuring the electrification of the poor. This approach has successfully been implemented in the licensing of mobile telephone operators in Kenya. The licensing of the operators is based on, among other prerequisites, a demonstration of the

firm's ability to significantly increase the number of mobile telephone connections and areas of geographical coverage. The license awarded to successful operators includes a target number of new connections and geographical coverage over a specified period. Subsequent renewal of the operator's license largely depends on the extent to which it meets the target indicated on its license (CCK, Personal Communication, 2003). As a result of stringent regulatory enforcement, mobile telephony in has dramatically increased and has also lead to enhanced access and affordability of communication services among the poor. Kenya now registers one of the highest penetration rates in Africa in mobile telephony (Tse, 2005).

In addition, to ensure that the poor's access to electricity is sustainable, the regulatory agencies should ensure that tariff increments do not adversely affect the poor by providing for subsidies as well as encouraging utilities to utilize low cost electrification options.

7.2 Technical Options for Improving Access to the Poor

To ensure increased access to the poor at an affordable cost, low-cost electrification options are an ideal solution. Some African countries have already adopted low-cost electrification options. South Africa, Zimbabwe, Uganda, Botswana, Cote d'Ivoire, Malawi, Gabon, Eritrea, Morocco and Tunisia are case examples of countries that have successfully adopted low cost electrification options. These options include the following:

Longer distances between distribution transformers: In Kenya, a standard of 600 metres is used irrespective of consumer density or load demand. By contrast, Uganda's transformer locations are determined on a line-by-line basis depending on current and future demand growth. In rural Uganda where demand is low and characterized by slow growth, distances between transformers of up to 1,000 meters are common. Optimal design criteria should therefore be adopted in this project without ignoring voltage drop problems.

Single pole transformer mounting: Another possible option for lowering the costs of rural electrification is to mount smaller transformers serving rural communities on single pole structures. These will not only reduce the number of poles but also eliminate the need for other components like cross-arms, as well as reduce associated labour and transport costs.

Shorter, smaller and fewer poles may also be used in some rural areas subject to design criteria such as climatic conditions, terrain and safety factors. On average, for grid extension, extra poles

are often required for a distance of more than 30m. However, with appropriate design that takes account of prevalent climatic and safety issues, studies have shown that the number of poles per kilometre could be reduced without adversely affective performance and safety (NRECA, 2000).

Pre-fabricated wiring systems: Pre-fabricated wiring systems, also known as ready boards, is a single multi-socket outlet fixed in a room into which various electrical household appliances can be plugged. Ready boards are used extensively in South Africa, and to a lesser extent in Malawi, and reports indicated that they are well suited for low-income households. For example, in South Africa, they have been tested successfully in various types of houses, from mud plastered to concrete blockhouses, where they are reported to provide savings of upto 75% when compared to the conventional internal wiring of houses (Thom, 2000). Ready boards (usually coupled with prepayment meters) are now standard features in some of South African urban low-income housing schemes (Paarl Post, 2003).

Load limiters: These are miniature circuit breakers limiting the amount of electricity,which could be used by a household. These are ideal for households whose monthly consumption is very low - typical of the urban poor and rural households. Load limiters rather than meters can reduce the service connection cost, as they have a lower capital cost and reduce the size of cable required (Smith, 1998).

Table 34: Average cost of Load Limiters (US$)-1994

Country	Rating (W)	Average cost (US$)
Nepal	25	3.5
	100	12.5
China	-	15.0
India	-	15.0

Source: Smith, 1998

In Africa, experiences of the use of load limiters vary. For example, they have been discontinued in Malawi and Uganda, because consumers preferred metered electricity. In Zimbabwe, they have successfully been in use since 1960 (Floor and Masse, 1999). In South Africa, load limited supply is incorporated into the aforementioned ready boards.

Single Wire Earth Return (SWER): Since the 1950s, countries such as Australia needed to expand grid electricity to reach remote agricultural areas. However, loads were small and spread over a wide area (typical of the current situation existing in sub-Saharan Africa). In addition,

financial constraints required network construction to be economical to construct and maintain as return on capital took long. As a result, Australia[25] among other countries such as New Zealand, Canada, India, and Brazil turned to single-wire earth return (SWER) systems, which had been a success, especially in the supply of electricity to sparsely populated areas (Chapman, 2001; Da Silva and Kyokutamba, 2002; Armstrong, 2002). Although in Africa the current status of SWER systems is unknown, they are reported to have been implemented in Botswana, Cote d'Ivoire, Gabon, Morocco, Uganda, Eritrea and South Africa (Habtetsion, 2005; Chapman, 2001; Da Silva and Kyokutamba, 2002; Armstrong, 2002).

Although a number of inherent disadvantages are associated with the SWER option (for example, problems with load balance on the primary distribution line, restricted load capacity and the inability to provide a three-phase supply), there are many advantages to using SWER in sparsely settled areas, for instance (Chapman, 2001; Armstrong, 2002; Rural Power, 2002):

- Low capital cost — through fewer conductors, fewer pole-top fittings, graded insulation on distribution transformers, and fewer switching and protection devices. Although every new project will vary, savings of up to 30% per customer are common for long, lightly loaded feeders.
- Simplicity of design, which allows for speed of construction. This particularly applies to the stringing of a single conductor.
- Reduced maintenance costs, because there is only one conductor and no cross arm.
- Fewer bush-fire hazards, because conductor clashing cannot occur in high winds.

Reduced conductor sizes: Due to the low power demand in rural areas, it is sometimes possible to use smaller sizes of conductors. Smaller conductor sizes implies that they cost less hence could contribute to lowering the overall costs of rural electrification. Technologies such as aerial bundled conductors have been used to reduce the cost of distribution networks by as much as 15% in Zimbabwe (Dube, 2003).

High-mast community floodlights: Though not well documented, in South Africa and Zimbabwe, high-mast floodlight systems are prevalently used for providing light to centralized groups of households especially in low income urban areas[26]. For the proposed intervention, this application can be used in the project areas to provide lighting in market places and fish landing sites. These would have the positive impact of extending useful hours of operation for the community, thus

[25] Nearly 200,000 km of SWER lines are in use in Australia (Floor and Masse, 1999)
[26] In Kenya, a pilot programme is underway to use high-mast community floodlights to light up slum areas in Nairobi.

leading to higher household incomes that in turn, reduce levels of poverty. In addition, area floodlighting improves security.

Equipment standardization: Standardising equipment lowers costs as it allows for bulk procurement of parts and components for rural electrification.

A possible option of minimizing the cost of electricity among the poor is by providing subsidies to cushion them from the impacts of the high tariff increases triggered by reforms. However, available data on subsidies indicates that the non-poor are absorbing most of the subsidies. This is well illustrated by the Ugandan case where more than 90% of the total electricity subsidies are captured by the non-poor. In Kenya, however, the Electricity Regulatory Board plans to revise policies pertaining to electricity tariffs and tariff structure to ensure that subsidies are better targeted and largely captured by the poor (ERB, 2005).

Table 35: Estimation of Subsidies Distribution in Uganda (1999)

Indicator	Value
Total amount of subsidy (Ushs)	7,725,246,270
Total domestic electricity consumption (kWh)	307,100,000
Average subsidy per unit (Ushs/kWh)	25.16
Electricity consumption by poor (kWh)	21,200,000
Estimated subsidy captured by poor (Ushs)	533,392,000
Estimated proportion of total subsidy (%)	6.90
Electricity consumption by non-poor (kWh)	285,900,000
Estimated subsidy captured by non-poor (Ushs)	7,193,244,000
Estimated proportion of total subsidy (%)	93.10

Sources: Calculations based on Kyokutamba, 2003; Okumu, 2003

7.3 Ensuring the Use of Environmentally-Sound Electricity Generation Options

With regard to ensuring the sustainability of the power sector from an environmental perspective, the following are possible options:

Review of Electricity Acts: Electricity Acts should be amended to ensure environmentally harmful electricity generation, transmission and distribution entities that were installed prior to EIAs becoming mandatory are assessed and mitigating measures carried out. The electricity regulatory agencies could enforce this requirement by linking it renewal of licenses and the review of tariffs.

Explicit targets for the share of renewables in the electricity generation mix: To mitigate the negative trend of having an excessively large share of IPPs generating electricity from fossil fuel-based power plants, it is proposed that the regulatory agencies in collaboration with the Ministries of Energy should set explicit targets for the share of electricity generation from proven renewable energy technologies such as hydro, wind, solar PV, bagasse-based cogeneration and geothermal[27]. Kenya provides a model example where such targets have been set. In Kenya, the Government has set a target of 25% of electricity generation to come from geothermal by the year 2020. There is already an IPP actively exploiting this option as part of the process aiming at meeting the year 2020 target.

Modular development of electricity generation facilities: In order to minimize the potential negative environmental effects of large scale electricity generation installations, power development planners in the region should consider including small to medium scale but reliable power plant that are also environmentally friendly. Small hydro, wind, bagasse-based cogeneration and geothermal energy sources appear to fit into these criteria. In addition, modular development of electricity generation facilities can ensure an incremental growth in generation capacity to meet the increase in demand in an economically and cost-effective fashion.

7.4 Addressing Gaps and Barriers in the Legal and Regulatory Framework

With regard to addressing gaps and barriers in the legal and regulatory framework, there are several options that could ensure the power sector's sustainability. Essentially, enforcing some of the options discussed earlier in this section could go along way in ensuring the sector's sustainability:

Strengthening the regulatory agencies: Probably the most effective measure in addressing the gaps in the legal and regulatory framework is ensuring the independence of the regulatory agencies.

[27] As mentioned earlier, the most promising geothermal resources are concentrated along the Rift Valley in the eastern African region and may therefore not be applicable to countries in other regions of Africa.

This can be achieved by enhancing the representation among the board members. For example, having a representative of the poor on the board of the regulatory agency could ensure that the plight of the poor is heard especially with respect to electrification and review of electricity tariffs.

Mobilizing local capital investment: The examples of Zimbabwe and Mauritius demonstrate the potential financial and technical capability and viability of local private investors in the power sector. This is corroborated by findings from recent AFREPREN studies which seem to indicate that local private investors can own and operate small to medium scale entities in the power sector, either on their own or with foreign partners (see Marandu and Kayo, 2004). Appropriate policy and financial incentives such as lowering entry requirements and tax holidays should be enacted to encourage local private investment in a privatised electricity industry. The ideal entry point, as in the case of Zimbabwe and Mauritius, is likely to be in small hydro and wind energy sources as well as through local cogeneration in the agro-based industries.

Encouraging private participation and unbundling even in small power systems: Some proponents of power sector reforms have in the past argued that small power systems (i.e less than 500 MW) cannot be viably unbundled. However, there are lessons that can be learnt from a country such as Uganda. With an installed capacity of just above 300 MW, this country has not only fully unbundled its utility but also registered positive returns. In addition at all levels of the power sector, there is active private participation.

Issuing licenses and Power Purchase Agreements (PPAs) covering a longer period: Issuing longer term licenses and PPAs can ensure that the selling price of electricity by IPPs is moderated. This is essentially because, longer term agreements allow for sufficient time for the investor to pay off project financing debts as well as provides adequate amortization period for the equipment.

Overcoming challenges of rural electrification: Perhaps the most common barrier of rural electrification identified is the high cost of grid extension. An immediate option to lower the cost of rural electrification is the use of proven low cost electrification options such as those identified in this study. Another option is the promotion of decentralized electricity generation in rural areas using hydro, wind, bagasse-based cogeneration and where applicable geothermal. This would greatly reduce the need for transmission lines to transverse long distances and sometimes difficult terrain. However, while these technical options are attractive, the policy framework has to provide adequate incentives to realize the benefits of these options.

Leveling the 'playing field': As mentioned earlier, electricity regulatory agencies could play a significant role in promoting proven environmentally friendly electricity generation options such as

hydro, wind solar PV, bagasse-based cogeneration and geothermal. The regulatory agencies could promote these technologies through setting of specific targets as well as providing for preferential tariffs for their electricity sales. In addition, regulatory agencies could provide attractive incentives to investors willing to install electricity generation plants based on these energy sources.

To sum up, based on preliminary assessments of the socio-economic and environmental impacts of power sector reforms, this study concludes that reforms have not done enough to ensure the sustainability of power sector. To ensure the sector's sustainability, reforms have to be redesigned to ensure that access to the majority of the population - the poor - is enhanced. In addition, the sector's sustainability can also be enhanced by ensuring a favourable share of renewables in electricity generation. Above all, the electricity regulatory agencies must carry out their mandate by protecting the poor by ensuring increased access to electricity and provision of subsidies as well as promoting proven renewable energy options for electricity generation. There is also need to address need to address the identified gaps and barriers in the legal and regulatory framework as proposed in this study to ensure that the power sector is sustainable.

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