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POWER SECTOR DEVELOPMENT IN AFRICA

Prepared by

Dr. Xolani Mkhwanazi
CEO, National Electricity Regulator, South Africa
and
Chairperson, African Forum for Utility Regulators

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POWER SECTOR DEVELOPMENT IN AFRICA

Paper for the NEPAD Energy Workshop, Senegal, June 2003

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Dr Xolani Mkhwanazi

CEO, National Electricity Regulator (NER), South Africa

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Chairperson, African Forum for Utility Regulators (AFUR)

'With some exceptions, in the countries of sub-Saharan Africa only 5 – 20% of the population have access to electricity, with supply being limited almost entirely to urban areas. This is in marked contrast with certain other parts of the developing world, where electricity is available to over half the population, with a considerable advance in rural electrification, despite general levels of poverty comparable to those prevailing in sub-Saharan Africa. Even this very limited supply, restricted as it is to higher income groups and modern industry and infrastructure in urban areas, is prone to repeated failure, as manifested by power rationing, brownouts and blackouts.'

M R Bhagavan

1. Introduction

The provision of low cost and reliable electricity supply is critical for the growth and development of African countries. NEPAD recognizes that benefits can be obtained from the regional and inter-regional trade in electricity and greater co-operation between the continent's power utilities and regulators.

The objective of this paper is to briefly outline the status of the African power sector, discuss some of the problems facing the sector; identify the technical and non technical barriers to electricity trade; identify strategies and policies to upgrade and modernize infrastructure; address the need to promote a regional and sub regional approach; and propose strategies and policies on power sector development.

This background paper is intended to inform and stimulate discussion around the development of a programme of action for the African energy agenda, which will be the concrete output of a workshop of African energy experts to be held in Senegal during June 2003.

A key component of any plan of action is a harmonized regulatory framework for the power sector. This topic is being addressed in another paper for the workshop, and is accordingly not dealt with in this background paper.

2. Status of the African Power Sector

Africa has a very small power sector in comparison with its geographic size and population. The size of the power sector is as follows¹:

	MW	%	GWh production	%
West Africa	9498	10,01	21190	6,26
Southern Africa	50007	52,70	197481	58,34
North Africa	28905	30,46	101688	30,04
East Africa	2875	3,03	10083	2,98
Central Africa	3454	3,64	7696	2,27
Totals	94898	100	338485	100

In comparison, the total African power sector is about the same size as the German system, or about a ¼ larger than the size of the United Kingdom system.

Numerous small interconnections exist between many neighboring countries, but the only working regional power pool is the Southern African Power Pool (SAPP). In addition, progress is being made towards finalizing the establishment of a West Africa Power Pool (WAPP).

SAPP was established in 1995, although the Southern African Development Community (SADC) region has a long history of bi-lateral trading which started in the 1950's. It currently has 12 members, 8 operating members and 1 observer member (HCB Cahora Bassa of Mozambique). The 12 members are: South Africa, Botswana, Swaziland, Mozambique, Lesotho, Namibia,

¹ The statistics are provided by African Union regions for 2001. It is difficult to obtain accurate, reliable and up to date information about the power sector from a number of African countries. A key NEPAD initiative in the power sector must therefore be to put in place a process to collect, store, update and disseminate information about the power sector to assist in decision-making processes and future planning.

Zimbabwe, Zambia, Angola, DR Congo, Malawi and Tanzania. Members are national utilities, but this is being revised to include other participants in future. The southern network is predominantly thermal generation, while the northern network is predominantly hydropower, and these two systems were interconnected in 1995 through a major line connecting North and South (South Africa to Zimbabwe via Botswana). SAPP is governed by a number of inter-governmental and inter-utility agreements, and functions according to rules of operation and standards agreed to between the operating members. Initially it operated as a voluntary pool with no dispatching on economic merit, with bi-lateral contracts dominating. However, a spot market among participants has now developed (called STEM - Short Term Energy Market), and more recently an hourly bi-lateral energy market (called BEM) has become operational to complement STEM. The SAPP co-ordination center is in Harare, Zimbabwe. The pool consists of a number of control areas. A control area may consist of more than one country. For example, South Africa, Botswana, Swaziland, Mozambique and Lesotho operate as one control area. Although the majority of electricity traded in SAPP (2294 MW in 2002) is still through bi-lateral contracts (in excess of 95%), STEM and BEM trade increased at over 20% a year from 2000 to 2002.

WAPP has been under discussion for nearly 20 years. USAID technical assistance began in 2001, which has helped to progress its implementation. It involves 14 West African countries, already affiliated through ECOWAS (Economic Community of West African States), namely Nigeria, Ghana, Ivory Coast, Senegal, Benin, Togo, Burkino Faso, Mali, Gambia, Niger, Guinea, Guinea-Bissau, Liberia and Sierra Leone. The region is characterized by a large and unmet demand, which is being exacerbated by electricity supply problems in Nigeria. All ECOWAS countries see benefits from regional (and subsequently inter-regional) co-operation in the development of cost effective electricity infrastructure and energy trading networks in order to increase energy supply and enhance energy security within the region.

Africa is fortunate in being endowed with rich and abundant natural resources. But, unfortunately, these are not evenly spread across all countries. As can be expected, a variety of energy sources are utilized for power generation. The bulk of the electricity produced in Africa (82%) is from thermal stations. This is because of the dominance of the South African coal fired plants, and oil fired units in Nigeria and North Africa. Hydro-electricity is dominant in sub-Saharan Africa (excluding South Africa), making up 15% of Africa's installed capacity. There is only one nuclear power station (Koeberg, in Cape Town, South Africa), which supplies 3% of Africa's power needs. Natural gas is seen as playing an important part in supplying new power plants, especially as a means of diversifying away from expensive oil. This is particularly the case in West Africa, but South Africa is also aggressively establishing a natural gas sector, with the first gas from Mozambique expected to start flowing southwards within a year. Geothermal plants are operating successfully in

Kenya, and a small number of renewable plants (solar, wind etc) are operational in different countries.

Importantly, the diversity of energy resources in Africa is not being optimally utilized. This is mainly due to the absence of local demand, and the lack of suitable transport infrastructure. This results in wasted energy, such as the vast hydro resources on the Congo River (in DR Congo) and the flaring of gas in Angola.

Most African power utilities remain state (government) owned, with privatization being the exception rather than the rule. However, many countries are considering the privatization of all or part of their power sector. This is most often done in conjunction with a programme to privatize state-owned utilities generally. More commonly, many countries have invited the private sector in to build new plants, or to take over the management of existing undertakings. This is frequently done to nurse the state-owned utilities back to health before they are sold off.

The changing nature of project finance has also had an impact on the power sector. With the diminishing role of grants, 'soft loans' and government funding, deals have had to stand on their own and repatriation of profits has become the expectation of investors and lenders. This has become even more important post September 11 and Enron with the adverse climate for investment in the power sector. Many projects have simply been unable to meet investor requirements. Satisfying investor requirements must therefore be given priority attention in NEPAD's work programme.

3. Problems in the power sector in Africa

Although the focus of this report is on ways to promote co-operation between countries and regions so as to encourage regional and inter-regional trade in electricity, it is also necessary to find ways of first improving the performance of the power sector in individual countries. By doing so, many countries could redress their existing energy constraints, or at least partly resolve some of their energy problems. But the poor performance of many of Africa's power utilities is also a serious constraint to them engaging in energy trading across borders. This is currently evident, for example, in the case of Zimbabwe, where the state-owned utility is battling to pay for desperately needed imports. Many African utilities must therefore first get their own houses in order before they can realistically contemplate the bigger regional and inter-regional picture.

Many African power utilities suffer from the following shortcomings:

- Poor (financial/technical) performance, resulting in poor quality of supply and service, and an inability to meet growing electricity demand;

- Insufficient managerial and technical skills to do the job;
- Inability of the country's governments to fund expansion or refurbishment, or to attract private sector investment into the power sector;
- Lack of maintenance of existing facilities leading to reliability problems;
- Inappropriate tariffs, often resulting from political interference, with tariffs below marginal costs; and
- Inadequate revenue collection mechanisms, and therefore credit unworthy businesses.

The relative inefficiency of the African power sector has been demonstrated in a number of studies. These studies show that it is possible to introduce changes in the power utilities to improve their performance. Two examples of such studies will be given here: the first study recommends certain structural/market preconditions that must be met for efficiency gains, while the second focuses on the internal changes needed in the governance of the power utilities themselves.

Allexon Chiwaya, Ikhupuleng Dube, Stephen Karekezi, Edward Marandu, John Mugenzi and Donella Mutiso in their book 'Reforming the power sector in Africa' (edited by M R Bhagavan) review the performance of the power sector in Malawi, Tanzania, Uganda and Zimbabwe. They conclude that it is not possible to resolve the problems in the power sector without substantially reducing the role of the state. They state as follows:

'The overall thrust of the reform process must be to distance the power sector from the concerns and interests of the political class and the state bureaucracy. In parallel, one must introduce and institutionalize incentives to both managers and workers to provide more efficient electricity services to the customer. The first step in this direction is to transform the power utility into an independent and self-contained corporation, but formally still under state ownership. As the corporate culture takes root, and management becomes used to taking and implementing its own decisions without constantly having to look over its shoulder at government, commercialization should be introduced. Commercialization will impose the discipline of commercial law and responsible regard for what the market expects and tolerates.

Neither corporatization nor commercialization will produce the expected results without the right kind of management in charge. Management that is essentially one of top bureaucrats wearing other hats is unlikely to be the answer. Competition to run the corporate utility should be promoted, and management contracts issued with built-in incentives that fetch a premium for good performance. Where the requisite management is not yet available locally, there should be an openness to recruit internationally. Under such conditions, there are good

prospects for turning around the fortunes of hitherto loss-making utilities and making them attractive to private investors’.

They then go on to propose a restructuring (‘unbundling’) of the industry into its three parts (generation, transmission and distribution), and suggest that, because competition *in* the market is not yet feasible in sub-Saharan Africa, that competition *for* the market be considered. Finally, they conclude that it is also necessary to set up independent regulatory bodies, distanced from political, corporate and other pressures.

‘The reform of the power sector is premised on the fundamental assumption that they can, at least, recover all their costs from the tariffs they are allowed to charge, and if possible, make a profit that can contribute to further investment in capacity expansion and upgrading of their system. Under these circumstances, it is essential to unburden the utilities of the rural electrification responsibility and place it elsewhere in the public sector, while at the same time facing the reality that without massive state investment and substantial subsequent subsidies electricity cannot be provided to the rural poor. At the technical level, one must discard the illusion that it is possible to provide, ‘at some time in the future’, grid-based electricity to the remote rural areas, and concentrate instead entirely on self-contained, stand-alone systems of generation and distribution.’

M R Bhagavan

G Elfaki Ali, I A R Elgizouli, B A Okech and P M Nyoike in their book ‘Energy Utilities and Institutions in Africa’ (edited by M R Bhagavan), research the performance of power utilities in Kenya and Sudan, and conclude as follows:

‘Contemplating the two very different experiences and outcomes of Kenya and Sudan, one can discern in outline some common general features with a bearing on the proper functioning of energy utilities and institutions. Public ownership need not necessarily signify below par performance, nor private ownership the absence of serious shortcomings. There emerge a number of ownership factors, of both structural and relational kinds, that together constitute the essential framework for promoting good performance and ensuring the continued relevance and appropriateness of energy organizations in Africa. These include:

- Autonomy of decision making at board level;
- Clear separation of powers and responsibilities as between the board and management;

- Freedom from undue interference (whether by national political or private corporate interests) in the operations of utilities as self-contained organizations;
- Clearly defined boundaries that sharply delimit the mandates and responsibilities of various actors in the energy sector;
- Non-proliferation of mandates within one organization;
- Functionally inspired rather than bureaucratically motivated co-ordination and linkages;
- Adequate staffing by highly skilled and competent professionals, combined with further specialist training; and, not least,
- Competitive terms of employment.

Irrespective of whether an energy institution is in the private or public sector, strategic and systematic moves in policy and implementation, at both board and management levels are called for to remain solvent. At the daily operational level, making and sticking to forward plans can forestall costly bottlenecks and breakdowns, and help to avoid the misery of permanent crisis management. Finally, the success of energy utilities, whether public or private, will depend on recognizing certain 'economic facts of life', among which are the following: tariffs based on real cost; effective collection of revenues; minimization of loss and wastage in the delivery of energy services; and internally generated re-investment in technological upgrading and new capacity creation'.

4. Promotion of regional and sub-regional electricity co-operation

There is a need for mutually beneficial regional electricity trade, where all participants can be perceived as 'economic gainers'. To meet the rapidly growing demand, and to improve the continent's prospects for sustained economic growth and development, a commitment from all countries is urgently needed to bring about regionally integrated solutions and significant new investment in energy infrastructure, particularly for interconnections.

SAPP is a working example of the benefits that can be obtained from regional cooperation in electricity trade. It is a successful African case study, which can be replicated into other regions.

All countries in the various regions of Africa can benefit from promoting regional solutions to regional energy problems. This can result in –

- Increased bilateral and multilateral cross border trading in energy resources;
- Increased availability of clean energy for regional consumption;
- New infrastructure built for cross-border transmission and transport of electricity;
- The development of regional energy markets that rationalize the development, transit and use of energy sources across the region and thus reduce the region's total energy costs and increase its energy security;
- Sufficient flexibility for the region's utilities to work together with private investors to implement the most economically viable projects to meet the region's increasing energy demand in an economically efficient and environment sustainable manner;
- The extension of reliable, good quality and paid for electricity to all populations;
- Attracting energy dependent industries into Africa; and
- The steadily improving quality of life for the region's increasing population.

Building on the successes already evident in Africa, increasing cross-border trade in electricity can act as the engine for economic growth and development of the continent for the benefit of her people.

5. Technical and non technical barriers to electricity trade

As demonstrated in section 2, the status of the power sector in different African countries varies considerably. Each country's power sector is at a different stage of development. Each faces different challenges. International experience demonstrates that regional or inter-regional electricity integration would bring substantial benefits to consumers in terms of lower costs and improved reliability and quality of service. These benefits could come from –

- Improvements in investment and operational efficiencies that result from the diversity in demand and resources for generation;
- Economies of scale and better operation of large projects conceived at a regional scale;
- Larger markets with greater competition that would better attract private investor's participation;

- Mitigation of the risks assumed by private investors; and
- Reduction of the environmental impact of developing generation resulting from a better usage of energy sources and generation plant siting.

Power trading in the different regions of Africa, or between regions, is limited with regard to available opportunities. This is an opportunity that can (must) be harnessed.

Some of the barriers to trade are as follows;

- Poor performance of many of the state-owned utilities, rendering them incapable of transacting normal commercial activities;
- The long distances involved, and the challenging geography and natural environment;
- The weaknesses of the national grids, which require strengthening (and hence investment) before trading is possible;
- Energy strategies that rely on self-sufficiency;
- Difficulty in obtaining project financing for cross-border transmission interconnections, and the difficulty (and complexity) of raising government guarantees for cross-border deals;
- The lack of a (commercial/legal/regulatory) framework for transactions to take place;
- The complexity of arrangements for system operation;
- Lack of agreement on the system of tariffs for use of transmission infrastructure;
- Mismatch of resources and demand, with energy deposits and proven reserves not necessarily located in countries with the highest demand or greatest need for these resources;
- Lack of infrastructure, such as power transmission interconnections and regional/inter regional co-ordination centers, or control centers;
- Lack of institutions to give regional trading political legitimacy and to play the co-coordinating and energy trade enhancement role;
- Lack of a legal framework for energy trade. (There is no common or uniform legal or commercial framework in most of the countries to

deal with cross-border electricity trade, and generally a lack of official support from governments for coordinated legal, regulatory and pricing policies);

- Lack of generally accepted accounting principles and standards in some of the countries;
- Lack of general harmonization of technical codes, specifications and standards; and
- Lack of trading mechanisms in the energy sector, which is much more complex than other goods or commodities.

In addition to these barriers, the unsatisfactory political climate in many parts of Africa is a serious constraint to greater co-operation in the power sector. It is difficult for normal commercial trading to take place in war zones. There is also often the lack of political will to undertake cross border ventures, and the lack of continuity of economic policies in some of the countries interferes with long-term planning. This lack of trust between some countries is a serious impediment to progress.

It is also the case that many countries in Africa are already short of commercial energy themselves, and exporting electricity is obviously not a priority in such circumstances.

Also, there is often little trade of non-energy commodities amongst countries in the regions/sub-regions, thus often no experience or confidence amongst countries to trade with each other.

Perhaps the most important barrier to trade in electricity is the lack of appreciation of the benefits which can be accrued from electricity trade between the respective countries by stakeholders and decision makers, including government ministers, technocrats, and even the business sector. Importantly, a study should be undertaken to demonstrate these benefits to decision-makers. A robust communication campaign targeting selected decision-makers, emphasizing existing success stories (such as SAPP and WAPP) must be a priority.

6. Strategies and policies to upgrade and modernize infrastructure, including possibilities of attracting investment

Like in other parts of the world, African power utilities differ in size, modernity, competency and credit worthiness. While Africa has a few world-class power utilities, most of its utilities are relatively small, saddled with old equipment and have to manage with out of date business and commercial practices. A 'one

size fits all' approach to strategies and policies to upgrade and modernize power infrastructure is thereof not ideal.

'Successful reforms in the power sector depend on mutual accommodation of the various concerns of the funding institutions, government and local interests.

The wealth of international and regional experience in the restructuring and privatization of public enterprises must now guide the region's power sector reforms. This does not mean applying the successful reform models blindly. What is important is to adapt such models to suit prevailing socio-economic conditions. It should always be noted that the legal, regulatory, institutional, political and economic framework should all aim at attracting investment in the power sector, and thus in the economic growth of the region. Already the process of deregulation and structural reform is creating a competitive investment atmosphere, as in the case of SAPP. This attractive investment atmosphere will bring about development of the power sector on a regional scale, removing hurdles when full interconnection of the power systems in the region begin to be implemented. With interconnections, power trading follows logically, and should lead to the emergence of a single power entity in the region. Because electric power is a prime mover for the economy, the success of a unified power entity would promote growth in all sectors of the economy and ensure the birth of regional development.'

Allexon Chiwaya

Initially therefore, the focus should be on reforming those state-owned power utilities that are not performing adequately. This involves a comprehensive remodeling exercise, including making changes to the prevailing policies and regulations to permit private sector investment and competition where possible. A significant effort will have to go into ensuring that the management of the utilities is competent to undertake the task. Once the power utilities themselves are operating optimally, it is possible to focus on regional and inter-regional trade.

For this to occur, a critical first step is to undertake a study (using consultants for legitimacy) to identify opportunities for further regional /inter-regional trade between African countries. This has already been identified as a NEPAD initiative, and must be accelerated. The study will demonstrate the advantages available from regional trading. Making regional trading work will require a concerted and multi-faceted approach to address the current barriers to trade.

The first strategy should thereof be to utilize the expertise available in the modern and efficient utilities to assist less able utilities. This includes benefiting from the strong balance sheets of these utilities to attract investment. An example of this strategy in the decision by Eskom of South Africa to establish a subsidiary (called Eskom Enterprises) for engagement in the African power sector. This has been successful and can be replicated elsewhere.

The second is the removal of trade barriers and the dismantling of restrictions in domestic and foreign private investment. This will require political endorsement at African Union level.

The third is the reform of financial systems and the embracing of market-friendly policies. This requires improvements in sub-regional economic co-operation, including measures to facilitate cross-border investments and measures to facilitate cross-border movement of goods and services.

The fourth is the establishment of sound market rules. These would:

- Provide open, non-discriminatory access to transmission grids and allow for international exchanges;
- Provide for economic dispatch including any additional supply and demand from international interconnections;
- Observe safety and quality of service criteria agreed upon under interconnection agreements;
- Provide access to pertinent data; and
- Ensure compliance with legal agreements.

The fifth is the establishment of technical codes, specifications and standards to promote harmonization.

To ensure a sound legal and regulatory framework for operating interconnections, international agreements would be required to ensure compliance with these conditions. These could be dealt with under African Union prescripts. It is only once these elements are in place that private investors will be prepared to invest.

Lessons can also be learnt from other similar international experiences such as the Scandinavian grid, the South American interconnections and US/Canada interconnections. Of course the examples closer to home (SAPP and WAPP) must also be studied closely.

7. Action Plans

It is important to recognize that agreed-to plans must be capable of being realized. It is not ideal to put forward a suite of proposals that are unlikely, for a variety of reasons, to be achievable.

It is accordingly proposed that the following broad approach be followed:

- i. Focus be placed on the improvement of the performance of the power sector in each country;
- ii. Promotion of / increase in cross-border trading to be identified and implemented;
- iii. Regional plans be identified for the trading of electricity on a regional basis (such as SAPP and WAPP);
- iv. Inter regional trading opportunities be identified for implementation at an appropriate time.

The following action plans are therefore proposed-

- The conclusion of an 'Energy Treaty' (along the lines of the Energy Charter Treaty of the European Community) to be concluded at NEPAD or African Union level. The treaty will encourage co-operation in energy matters. It will essentially say that all countries will consider regional options when making decisions about their local energy needs/future needs;
- Establishment of an 'African Forum of Power Utilities' as a place where power utilities can foster cooperation;
- Acceleration of the activities of the African Forum for Utility Regulators as the forum for co-operation between African regulators (with the power sector being given special attention);
- Establishment of a Committee of African Energy Officials under the NEPAD initiative to facilitate the harmonization of a common and consistent legal and regulatory framework to promote cooperation in the power sector, as well as the harmonization of standards and specifications;
- Acceleration of the already identified NEPAD power initiatives to demonstrate that benefits can be realized under cross-border energy trading.

The idea is to learn from the initiatives already underway (such as SAPP and WAPP), while continuing with bi-lateral and regional co-operation under the

'political umbrella' of an Energy Treaty, which will foster ongoing regional cooperation.

As part of the process of moving forward, countries will have to accept certain objectives and principles which will guide them towards accelerating regional and inter-regional electricity trade. These can be included in the Energy Charter. The following set of initial objectives and principles are proposed for discussion and deliberation by delegates to the NEPAD workshop, namely:

(1) The objectives of regional energy trade

The objectives of regional energy trade can be identified as follows-

- To increase sustainable energy supply and improve energy security within the regions by institutionalizing more extensive and effective regional co-operational in the development of cost effective and cleaner electricity infrastructure and energy trading networks;
- To lower energy costs by more effectively and efficiently managing the regions geographic, seasonal and daily imbalances and optimizing the utilization of energy resources across the region through increased energy trading;
- To reduce the overall amount of capital needed for the expansion of energy systems in the region by creating an investment environment that will facilitate the implementation of environmentally sustainable and bankable projects on a least-cost basis;
- To establish an ongoing forum that can effectively share information, build trust and consensus, and work out and agree upon regional energy issues within an agree upon policy framework and set of operating principles,
- To create transparent and reliable mechanisms for the prompt settlement of commercial energy transactions and resolution of disputes.

(2) Agreement on principles

Participants would have to agree, inter alia, on the following set of principles-

- Cooperation among all energy market participants improves the quality and availability of information and promotes a common understanding of regional energy issues and trends;
- Diversity, efficiency and flexibility within the energy sector are basic conditions for long-term energy security;
- Sustainable energy development requires the harmonization of economic development goals, energy security policies, and environmental policies;

- The development of more open, efficient, non-discriminatory, transparent and competitive energy markets in the region will create a more secure investment framework for increased energy infrastructure development; and
- Cross–border energy pricing must be market based. Over time energy pricing within each country should move towards covering the full cost of supplying and using energy.

8. Conclusion

Electricity trade between African countries can be increased considerably. This will reduce total energy costs and increase energy security. Working together will boost trade and bring benefits to the economies of participating countries, and promote the socio-economic well being of their populations. But it is necessary to remove existing barriers to trade to achieve this, and action must be taken to introduce the reforms that are needed to attract investment.

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