OCCASIONAL PAPER NO 46

Development Through Trade Programme

September 2009

Trade in Electricity Services in the Southern African Customs Union: Towards a Negotiating Strategy

Tsidiso Disenyana and
Cézanne Samuel

South African Institute of International Affairs

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SAIIA gratefully acknowledges the Australian Agency for International Development (AusAID) and the Swedish International Development Agency (SIDA), which has generously supported the DtT Programme.

Programme head: Peter Draper peter.draper@saiia.org.za

South African Institute of International Affairs
Jan Smuts House, East Campus, University of the Witwatersrand
PO Box 31596, Braamfontein 2017, Johannesburg, South Africa
Tel +27 (0)11 339-2021 • Fax +27 (0)11 339-2154
www.saiia.org.za • info@saiia.org.za

ABSTRACT

The development of a country's electricity sector is crucial for broader economic growth and economic and social development. The electricity sector in the Southern African Customs Union (SACU) member states is facing chronic challenges, including lack of surplus capacity, and underdeveloped power transmission and distribution infrastructure, resulting in losses in production. Hence, electricity's contribution to the high cost of doing business in the region is increasing.

Regional power utilities have enjoyed a monopolistic hold over their national electricity industries, which has contributed to the inadequate delivery of electricity services. The scale of capital requirements for new projects and the pressure this could place on countries' balance sheets have increased the importance of private participation in the sector.

Yet in most countries in the region, independent power producers have not gained much footing, partly because regulators are not politically powerful enough to take on state-owned monopolies. Electricity pricing is also a barrier that stems from the region's historically low unit price of coal and electricity, although there has been a gradual rise in electricity prices over recent years, and large-scale investments cannot be justified due to the lengthy paybacks involved. The most pressing issue across all SACU member states (with the exception of Lesotho) is the failure of electricity providers to recover their full costs. Subsidies have been largely blamed for this.

Liberalisation in electricity services subsectors should be supported by a clear government policy in this regard and an appropriate legal framework in order to prevent abuses and provide incentives that encourage investment in the sector. Consequently, the Regional Energy Regulators Association has a role to play in supporting national regulators to open up domestic markets and thereby enhance regional expansion in electricity trade.

ABOUT THE AUTHORS

Tsidiso Disenyana is deputy project head for the Development through Trade Programme at the South African Institute of International Affairs (SAIIA). His prior work experience includes consultancy with PD Consultancy in Pretoria; general management in his family business; economist at the Export Credit Insurance Corporation of South Africa; and research manager, Regional Economic Relations, Department of Trade and Industry, South Africa. He holds an MA in Economics (Policy Studies and Public Finance) from Georgia State University, Atlanta, United States.

Cézanne Samuel is currently an intern at SAIIA and is completing her MCom in Economics at the University of the Witwatersrand. Previously she worked as a junior researcher at the African Micro Economic Research Unit at Wits University, and then at the South African Reserve Bank, where she participated in the Cadet Graduate programme.

ABBREVIATIONS AND ACRONYMS

BPC	Botswana Power Corporation
DRC	Democratic Republic of Congo
ECB	Electricity Control Board
EdM	Electricidade de Mocambique
EPA	Economic Partnership Agreement
Eskom	Electricity Commission of South Africa
EU	European Union
GATS	General Agreement on Trade in Services
GATT	General Agreement on Tariffs and Trade
GDP	gross domestic product
GW	gigawatt
GWh	gigawatt hour
HCB	Hidroelectrica de Cahora Bassa
IPP	independent power producer
kV	kilovolt
kWh	kilowatt hour
LEA	Lesotho Electricity Authority
LEC	Lesotho Electricity Corporation
MFN	most-favoured nation
MW	megawatt
NamPower	Namibia Power Utility Agency
NERSA	National Energy Regulator of South Africa
PPA	power purchase agreement
PV	photovoltaic
RERA	Regional Electricity Regulators Association of Southern Africa
SACU	Southern African Customs Union
SADC	Southern African Development Community
SAPP	Southern African Power Pool
SEC	Swaziland Electricity Company
SNEL	Société Nationale d'Electricité
SPV	special purpose vehicle
STEM	short-term energy market
TRIMS	Trade-Related Investment Measures
TRIPS	Trade-Related Aspects of Intellectual Property Rights
UNECA	United Nations Economic Commission for Africa
VAT	value-added tax
WTO	World Trade Organisation
ZAR	South African rand
ZESA	Zimbabwe Electricity Supply Authority
ZESCO	Zambia Electricity Supply Corporation

BACKGROUND

Services are without doubt a key driver of economic growth and they fundamentally influence (or determine) the trade capacity of countries. Like many other World Trade Organisation (WTO) member states, Southern African Customs Union (SACU) countries recognise the importance of a more liberal services trade regime in enhancing the availability and quality of key services like communications, transport, energy, construction and financial services that are vital to economic growth and trade competitiveness.

Although the SACU Agreement does not cover the liberalisation of trade in services, SACU member states have engaged in services trade liberalising activities primarily through unilateral policy measures, whether bound in the WTO's General Agreement on Trade in Services (GATS) or not, and through the implementation of a range of Southern African Development Community (SADC) protocols.

Article 23 of the SADC Trade Protocol underlines the importance of trade in services for overall economic development and encourages member countries to adopt policies and implement measures with a view to liberalising their services sectors within the region. In order to implement the provisions of Article 23, SADC countries decided to have a separate Protocol on Trade in Services, which was approved in July 2007 and was expected to be adopted and signed in 2008. The draft protocol sets out the framework for the liberalisation of trade in services among SADC members and will serve as a basis for negotiations. Starting with six key services sectors (construction, communications, transport, energy, tourism and financial services), the envisaged liberalisation process seeks eventually to cover substantially all sectors and modes of supply. The aim is to reach a stage where each member state will treat the services emanating from other members and the suppliers of such services in the same way as its own services suppliers and the services they supply. In terms of this plan, substantial liberalisation of intra-regional trade in services is to be achieved no later than 2015.

Furthermore the lack of common policies or positions on such issues as services has increasingly come under the spotlight in SACU's trade negotiations with external trade partners such as the US. It has been argued that as long as SACU countries are not harmonised among themselves, agreements with external parties covering trade in services may remain elusive. This poses the challenge of ascertaining to what extent the services markets in SACU may be integrated in practice; the regulatory environment that is providing this integration; and how harmonisation or regional trade agreements can enhance this integration. The scope of the present study is restricted to energy services, specifically electricity services.

The rest of the study is organised as follows: the second section briefly looks at classification and definition issues on electricity services. The strategic importance of and trade in electricity services in the region is discussed in the third section, which further covers an analysis of electricity services for each subsector in the region. A brief synopsis of the energy policy and regulatory environment is provided in the following section. The fifth section looks at reforms (pertaining to harmonisation and liberalisation) undertaken by SACU member states over the past few years, while the next section explores a negotiating strategy on electricity services. The final section concludes the study and makes recommendations on the way forward for SACU member states.

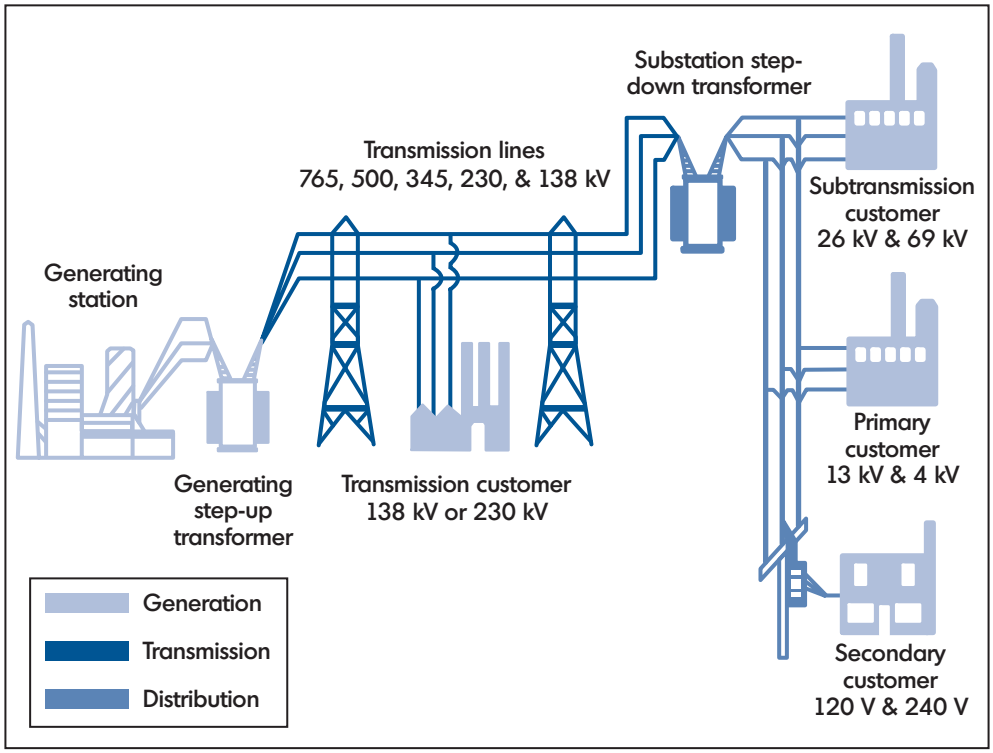
THE SCOPE OF ELECTRICITY SERVICES

Unlike other services, electricity services are often very difficult to categorise, because they have elements of both goods trade and services trade. For instance, electricity itself is considered a good. However, transmission and distribution of electricity is a service. Furthermore, many services that form part of the electricity production chain are in fact not core electricity services, e.g. construction, engineering, consulting, and so on.

The current discussion at the WTO is centred on the issue of classification, with some members making the development of satisfactory classification a prerequisite to undertaking any commitments in the sector.[1] There is also a debate on the distinction between core and non-core services to the electricity supply chain. Whereas non-core services are simply considered auxiliary to the supply chain, an activity that is considered as critical in the supply chain — meaning that without that service, the sector would not be able to function — is considered core service. However, it is difficult to draw the line between the two categories, especially if one has to decide which service could be viewed as crucial in the supply chain. However, this discussion is beyond the scope of this study.

For the purpose of this study, electricity services simply encompass all services related to all stages of the electricity production chain, including generation at power plants, transmission from power plants to customer areas, and retail distribution to individual customers.[2] Figure 1 shows a simplistic supply chain of the electricity sector.

Figure 1: Electricity supply chain



Source: Wikipedia, <http://en.wikipedia.org/wiki/File:Electricity_grid_simple-_North_America.svg>.

ELECTRICITY SERVICES IN SACU

Contribution to gross domestic product

Electricity is arguably the most dynamic of all energy products and can provide a wide variety of services, including provision of light, heat, powering of electronics, and so on. The sector is also inextricably linked with other sectors in an economy and thereby plays a critical role as an engine of economic and social development. Unfortunately, in Africa — with its vast hydropower, coal and renewable technologies resources — a combination of factors including lack of capital for new power generation, poor maintenance of existing infrastructure, inconsistent regulations and unattractive tariffs serve as constraints to flawless electricity supply.[3] The SACU region is no different in this regard.

The national accounts reports for SACU member states do not indicate the contributions of some individual service sectors to gross domestic product (GDP). This makes it difficult, for instance, to indicate the share of electricity services in the economy. Table 1 compares the contribution of various services sectors in the SACU member states' economies as measured by their GDP. Energy, natural gas and water have always been critical to SACU member states' economies. They account for 2.1% of GDP in South Africa, 1.62% in Botswana, 6.4% in Lesotho and 3.6% in Namibia.[4] Data for Swaziland is not available.

Table 1: Services sectors' contributions to GDP (%) in SACU member states, 2006

Country	Electricity, gas & water	Construction	Tourism	Transport & communications	Financial
Botswana	1.62	2.82	7.11	2.37	6.88
Lesotho	6.40	12.40	10.30	4.50	5.10
Namibia	3.60.	4.00	12.10	7.60	4.10
South Africa	2.19	2.57	13.93	9.47	22.04
Swaziland	n.a.	n.a.	n.a.	n.a.	n.a.

n.a. = data not available.

Source: SADC, 2006, *op. cit*.

Generation, transmission and distribution in SACU: An overview

Electricity in the region is generated mainly through fossil fuels and hydroelectric resources, with one nuclear facility in South Africa. Furthermore, a majority of the region's population still rely on the use of wood as their primary source of energy.[5]

Generation

As shown in Table 2, in 2007 total installed and available capacity in SACU was 43 709 megawatts (MW) and 38 984 MW, respectively. South Africa was the largest producer of electricity, accounting for approximately 99% of the region's total production.

Table 2: SACU electricity generation (MW), 2007

Country	Total installed capacity	Available capacity
Botswana	132	120
Lesotho	72	70
Namibia	393	360
South Africa	43 061	38 384
Swaziland	51	50
Total	**43 709**	**38 984**

Source: SAPP (Southern African Power Pool), *Regional Power Networking for Meeting Rising Demand and Sustainable Growth: Annual Report 2008*. Harare: SAPP, 2008, p. 26.

Salient country features include the following.

Approximately 88% of South Africa's electricity is generated from coal; nuclear energy accounts for 4%; and hydroelectric facilities and fuel turbines make up the remaining 8%.[6] The country has 27 power stations, comprising 13 coal-fired stations, six hydroelectric stations, four fuel-turbine stations, two pumped storage schemes, one wind-energy farm and one nuclear power station. Against the backdrop of escalating electricity demand coupled with diminished reserve margin,[7] the country is planning large-scale capacity expansion projects estimated at R343 billion.[8] The 2008 annual report of the Electricity Commission of South Africa (Eskom) shows that the country will deliver an additional 16 304 MW in generating capacity by 2017 by returning three old coal-fired stations to service, extending two open-cycle gas turbines and upgrading the Arnot power station, among other projects.[9] Greenfield generation projects include two coal-fired plants at Medupi and Eskom North Coal and two pumped-storage schemes at Ingula and Eskom North East.[10]

About 97% of Namibia's electricity is generated mainly from the 240 MW Ruacana hydroelectric plant, while other power stations include the Van Eck coal power station with 120 MW capacity and the Paratus diesel power station with 24 MW. The three power stations, combined with smaller sources of power, can supply up to 393 MW, while local demand peaks at 449 MW.[11] The shortfall is made up through imports. The country has undertaken projects and feasibility studies aimed at developing new power plants (hydroelectric, gas and coal) and it is considering moving into the production of nuclear energy, using its rich uranium deposits.[12] New projects include the proposed development of the 800 MW Kudu gas power station by 2010, a 400 MW Walvis Bay coal-fired power plant by 2013 and a 500 MW Baynes hydroelectric power plant on the Kunene River by 2013.[13] The surplus capacity generated from these plants is earmarked for export to other SACU member states.

Botswana's generating capacity is centred on the 132 MW Morupule coal-fired power station. With a national maximum demand of 496 MW, the country has to import 80% of its power to augment the shortfall.[14] Botswana Power Corporation (BPC) is investing $1.6 billion in new generation projects, including the planned Morupule power station expansion, which will add an extra 600 MW by 2010[15] and the private sector-led 2 400 MW coal-fired Mmamabula power plant.[16]

'Muela hydroelectric power station is Lesotho's anchor power generator, with an installed capacity of 80 MW, which is due to increase to 110 MW when phase 2 is completed in 2012.[17] The country is planning two other projects, i.e. Oxbow and Musanga hydroelectric power development stations, which are projected to generate 80 MW and 230 MW, respectively.[18] With the country's peak demand at 109 MW, surplus capacity generated is destined for export to the region, mainly to South Africa.

Approximately 80% of Swaziland's electricity is generated mainly from hydro power plants, with one diesel power plant generating 9.5 MW.[19]

Transmission and distribution

In terms of transmission, the region's integrated grid consists largely of 400 and 275 kilovolts (kV) lines, although 765 kV, 220 kV and 132 kV lines also exist.[20] The region's grid is dominated by South Africa's power lines, which extend for approximately 366 203 kilometres and serve 4.1 million electricity customers.[21] However, the upward trajectory of electricity consumption and demand has put the transmission infrastructure under tremendous pressure. As a result, the region's transmission performance has been significantly affected, measured by the high percentage of interruptions and losses experienced in 2007 (see Table 3).

Table 3: SACU electricity demand and transmission losses, 2007

Country	Peak demand (MW)	Number of customers	Transmission losses (%)[a]	Electrical outages for firms (average days per year)[b]
Botswana	496	180 601	3.50	21
Lesotho	109	58 900	11.00	19
Namibia	449	2 526	8.00	19
South Africa	36 513	4 152 842	2.14	5
Swaziland	196	58 800	16.00	29

a = Decrease in power that occurs during electricity transmission from one point to another.

b = The average number of days per year that firms experienced power outages or surges from the public grid.

Sources: SAPP, 2007, *op. cit.*; World Bank, *Little Data Book on Africa 2007*. Washington, DC: World Bank, 2008.

Table 3 further shows that electrical outages for firms in the region averaged 19 days in 2007. Most countries in the region experienced heavy load shedding throughout 2008 and, although data for 2008 on electrical outages for firms is not available, there is the possibility that the outages could also have risen substantially. For example, in January 2008 alone inadequate power supply shut most mines for five days in South Africa.[22]

One of the biggest challenges in the distribution subsector is the need to achieve universal access to electricity. The levels of electrification in the region are shown in Table 4. The fact that some areas are inaccessible (because of, for example, topography) and the grid cannot reach them makes universal access a difficult hurdle to overcome. To reach these remote areas, innovative approaches must be used in terms of technology and cost optimisation. Thus, most governments have looked to renewable energy technologies as an alternative.

Table 4: Access to electricity in SACU member states, 2007

Country	Access to electricity (% of total population)[a]	Access to electricity (% of rural population)
Botswana	37	43
Lesotho	11	1
Namibia	34	10
South Africa	70	50
Swaziland	27	n.a.

n.a. = data not available.

a = The percentage of the total, urban, or rural population living in households with access to electricity as a proportion of the total population or total urban or rural population.

Sources: SAPP, 2007, *op. cit.*; World Bank, 2008, *op. cit.*

Renewable energy

Whereas environmental concerns are a strong driving force behind the renewable energy market worldwide, in SACU renewable energy technologies are mainly directed at supplying energy to rural areas and poor sectors of the population who are mainly not connected to the grid, as part of the various governments' initiatives to facilitate the goal of universal access to electricity services.[23] The only exception is grid-connected small hydroelectricity production.

Most of the governments' rural electrification programmes, including clinics and water pumping, have been undertaken through solar photovoltaic (PV) cells, and this has seen the emergence of PV as the dominant renewable energy technology in the region since the turn of the century.[24]

South Africa and Namibia have good wind resource potential and this has generated interest in grid-connected wind turbines. Private initiatives in South Africa include the

Darling and the proposed Koekenaap 100 MW wind farms (the latter due to be in operation in early 2010).[25] In Namibia, proposed wind farms include Grosse Bucht, Oranjemund and Walvis Bay, which are expected to generate a combined 92 MW of power. Other proposed wind farms include Luderitz and Electrawind Walvis Bay — both are projected to generate approximately 50 MW when in operation.[26] A South African-based firm, Netgroup, has shown interest in wind power generation at Letšeng-la-Terae in Mokhotlong, Lesotho. The estimated annual energy production for the proposed wind farm is 37.3 gigawatt hour (GWh) and the net annual energy production from the farm will vary from 3.5 GWh to 3.95 GWh per wind turbine per year for a wind farm of 10 wind turbines.[27]

Most of regional biomass electricity generation is primarily from bagasse (i.e. electricity and heat generation from the combustion of sugar cane residues). Plants exist in South Africa (e.g. Tongaat Hulett Sugar Biomass). Swaziland in particular has considerable potential for biomass-based generation expansion; however, bagasse in that country is used to produce steam and electricity only to run the sugar plants, despite the availability of surplus bagasse.[28] The liberalisation of this subsector to allow competition may offer investment opportunities to independent power producers (IPPs) to transform this untapped energy source.

Co-generation opportunities exist in small and micro hydroelectric systems. Such systems already exist in Lesotho, South Africa and Swaziland. Most potential can be derived from water-transfer schemes, including dams, transfer tunnels and irrigation schemes.[29] Lesotho is currently planning to revive some of its systems in Tsoedike, Semonkong, Mantshoenyane and Mookhohlong.[30] This should present further opportunities for co-generation by IPPs and take load off the national system.

Nevertheless, unlocking the vast potential of the renewable energy market in the region is constrained by, among other things, the following factors:

- the lack of regionally acceptable standards for equipment and other accessories, thus restricting inter-regional trade in renewable energy technologies;
- over-reliance on donor financing without alternative means to investment in and sustain new projects;
- lack of a regional renewable energy investment framework — currently investments in this subsector are inward looking without consideration for potential regional impacts. The framework should ensure that potential polarisation of investment into one market is avoided;
- the lack of public awareness about the potential for renewable energy technologies; and
- the lack in most countries of sustainable incentive or subsidy schemes to encourage large-scale grid-connected renewable energy-based electricity systems, although South Africa has recently established a renewable energy feed-in tariff[31] to entice private investments into the subsector.

Lastly, up-to-date data on the structure, performance, pricing and other issues pertaining to the various renewable energy technologies is very scant in the region. This information is important for policy planning and for potential investors, who need it as a basis for their investment decisions.

Trade in electricity services

Electricity services are mainly supplied through commercial presence and cross-border trade. Commercial presence involves foreign direct investment, e.g. when a utility establishes a branch in the territory of another country, whereas cross-border trade involves the supply of electricity from one country to another.[32] This section focuses on cross-border trade.

SACU exports and imports

Trade in electricity services is already widespread in the region and takes place through the Southern African Power Pool (SAPP), which is discussed later in the paper.

The SACU region is a net importer of electricity, by virtue of having exported and imported 11 375 GWh and 16 657 GWh, respectively, in 2007. South Africa is the main exporter and importer, accounting for approximately 80% of total electricity trade in the region.

Table 5: SACU electricity exports and imports (GWh), 2007

Country	Exports	Imports
Botswana	0.0	2 572.0
Lesotho	7.4	49.0
Namibia	0.0	2 045.0
South Africa	11 368.0	10 998.0
Swaziland	0.0	993.0
Total	11 375.4	16 657

Source: SAPP, 2007, *op. cit.*

Where electricity generation is not enough to meet domestic needs, countries need to purchase power from their neighbours within the region and elsewhere. In this regard, the region is overly dependent on Eskom for electricity provision. Yet Eskom is currently running out of excess capacity, as domestic demand is outstripping supply. Hence, as the demand for power in South Africa increases, the likelihood of regional deficits also expands. This chronic shortage is expected to continue until 2011.[33]

The net effect is that for the foreseeable future the whole region will need a considerable increase in generation capacity to meet the growth in demand. While the key market for such power will probably remain South Africa, regional countries will also need to address the much increased local demand and attract new investors.

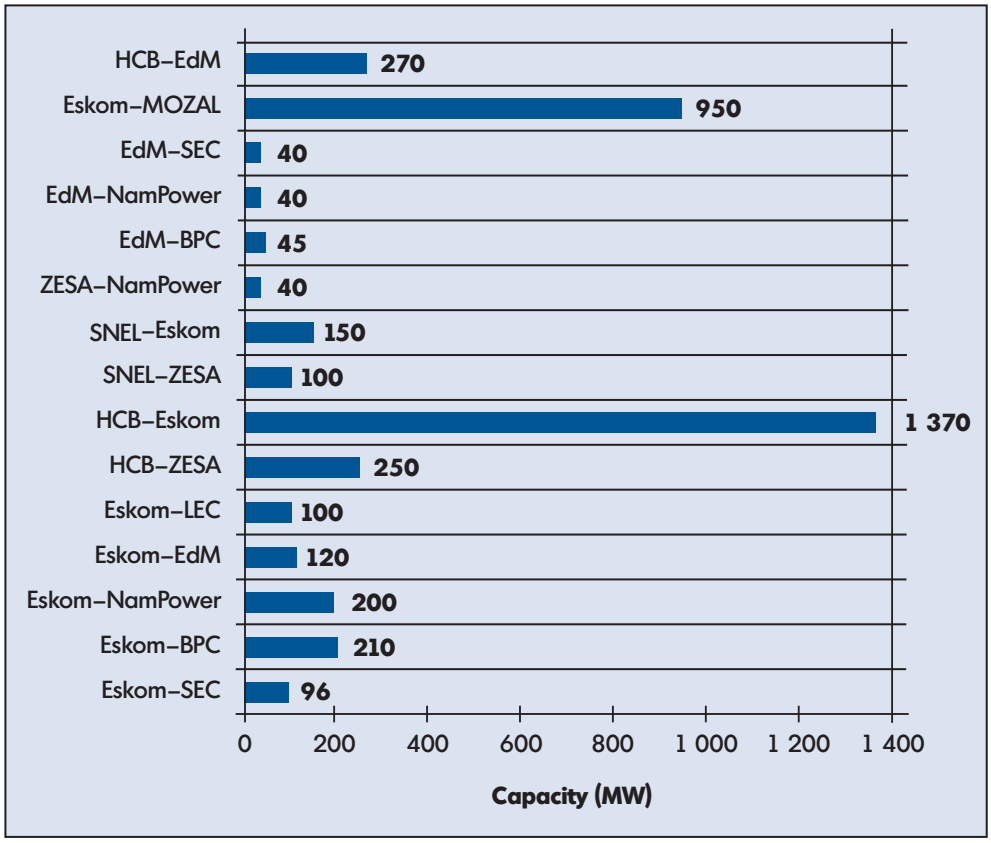
Southern African Power Pool

Prior to the establishment of SAPP, the most common form of managing exchange of electricity in the region was through bilateral agreements. Created in 1995, SAPP aims to provide reliable and economical electricity to the consumers of each member. The national utilities participating in SAPP are Angola's Empresa Nacional de Electricidade, Botswana's

BPC, the Democratic Republic of Congo's (DRC) Société Nationale d'Electricité (SNEL), the Lesotho Electricity Corporation (LEC), the Malawi Electricity Supply Commission, Electricidade de Mocambique (EdM), the Namibia Power Utility Agency (NamPower), South Africa's Eskom, the Swaziland Electricity Company (SEC), the Tanzania Electric Supply Company, the Zambia Electricity Supply Corporation (ZESCO) and the Zimbabwe Electricity Supply Authority (ZESA). Mozambique's IPP, Hidroelectrica de Cahora Bassa (HCB) and the transmission company, Motraco, a joint venture of Eskom, EdM and SEC, also form part of SAPP.[34]

Figure 2 show that inter-utility trading under bilateral electricity trading agreements is dominated by Eskom both as electricity exporter and importer, ZESA as an electricity importer and HCB as an electricity exporter.

Figure 2: Current trading arrangements among SAPP members



MOZAL = Mozambique Aluminium Smelter.

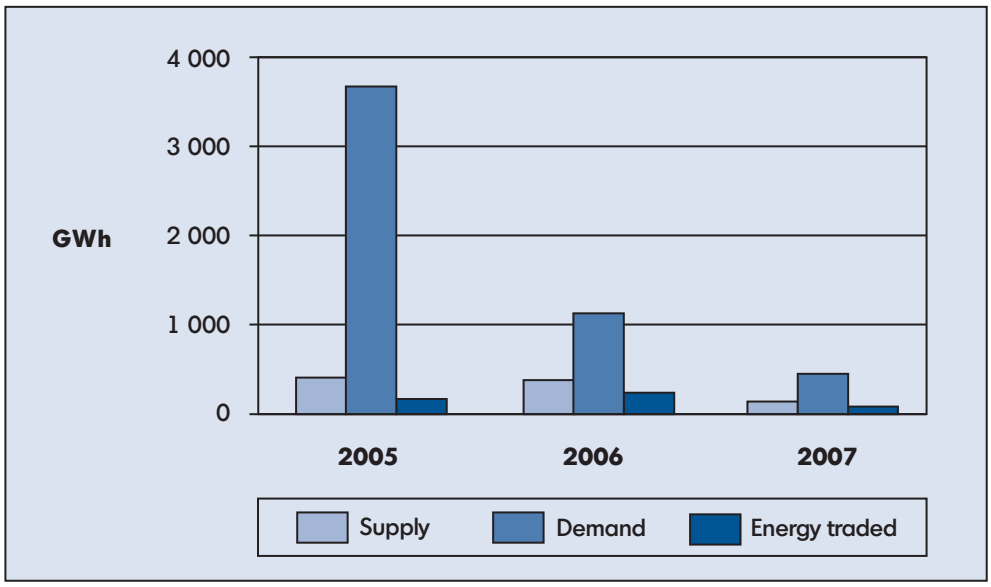
Source: Chikova A, presentation at the Forum on Interconnections and Electricity Access for Sustainable Development in Africa, Addis Ababa, Ethiopia, 4–5 September 2008.

SAPP offers bilateral long-term power purchase agreements (PPAs) and the short-term energy market (STEM) as trading mechanisms to its members. The former comprises bilateral contracts with a term of up to 15 years, whereas the latter facilitates contracts

of periods up to a month for the supply of electrical energy to individual customers and utilities. STEM is considered to be the 'stock exchange' of regional power supply, and the SAPP Co-ordination Centre is the facilitator. Its primary objective is to offer attractive economical electricity through competition.

It should be noted that as national utilities carry out power-generation planning from a national self-sufficiency rather than an inter-country perspective, some utilities have faced problems in meeting their contractual obligations for sustained electricity supply to their importing counterparts. Furthermore increasing domestic demand for electricity in exporting countries has made it difficult to continue to guarantee contractual capacity. This also limits actual volumes traded within SAPP. For example, in 2007/08, both supply and demand had reduced on STEM as compared to power supply and demand figures of 2006 and 2005 (see Figure 3). Other factors exacerbating this situation include power shortages and transmission constraints in most member states.

Figure 3: Energy trading summary, 2006–07 (1 April–31 March of the following year)



Source: SAPP, 2008, *op. cit.*

Furthermore, STEM trading took place only in the first four months of 2007. Thereafter, no offers and bids were submitted and energy trading took place through bilateral contracts only. This does not bode well for the future competitiveness of STEM.

SAPP currently has an installed capacity of about 54 684 MW, out of which about 46 494 MW is available. During the 2008 winter peak, the non-coincidental peak for the interconnected SAPP grid was about 43 857 MW.[35] Notwithstanding this surplus in the region, most utilities were experiencing load shedding during the peak period.

To halt power shortages in the region, SAPP has adopted both supply-side[36] and demand-side[37] management initiatives. Some of the measures include the development of energy-efficiency policies and related minimum standards for new electrical connections, adopting energy-saving electrical appliances, and the development of

clean energy technologies. Furthermore a conducive business environment for private sector involvement is also viewed as key. To achieve this, SAPP has advocated for the harmonisation of member states' electricity policy frameworks and more importantly, the adoption and implementation of the principle of cost-reflective tariffs.[38]

SAPP members are also planning generation projects that will meet both short- and long-term electricity needs.[39] Some of the projects to be commissioned include the following:

- projects that will add a total of 7 070 MW at a combined cost of $4.9 billion by 2008–10, for which a financing gap of approximately $186 million is envisaged. For projects earmarked for 2011–13, a financing gap of $13.5 billion for 8 800 MW is expected; and
- long-term generation projects that will add 44 000 MW at a cost of $41.5 billion by 2011–25.

Although the list of earmarked projects by SAPP members looks promising to augment the shortfall in the region, in fact, some of the projects on the list are probably not realistic, and a number of them will either be shifted out in terms of timing or simply never realised. Kügel shows that on the 2007 projects alone there was already (again) a time shift.[40] He further attests that the financial status of some economies and that of some of the energy utilities is so dismal that some of the projects on the list are nothing but a wish list.

POLICY AND REGULATORY ENVIRONMENT

Key policy and regulatory issues

Four of the five SACU member states (with the exception of Botswana) have established regulatory agencies of varying degrees of independence. The National Electricity Regulator of South Africa (NERSA) is the oldest, while the Lesotho Electricity Authority (LEA) is the most recently established. These institutions are charged with implementing government policy in the electricity sector, using the tools of price regulation and licensing.

The regulators in the region are still hindered by issues such as a lack of clear government policy and proper legislative frameworks to guide their participation in a competitive energy market. For example, regulations on the export and import of electricity are not well developed and licensing regimes are inadequate. Furthermore, there is still no clarity on cross-border tariff issues (especially wheeling charges), while uncertainty regarding third-party access to existing infrastructure still reigns.[41] The lack of political will to commit to private sector versus public sector development affects whether significant private investment becomes a reality or remains an elusive target. For example, political considerations often drive the setting of prices in the consumer's favour, hampering private sector involvement and new investments — not only because new IPPs' generation costs are unaffordable, but also because associated transmission infrastructure — owned by the same utilities — is often insufficient.[42]

Table 6 summarises key regulatory issues in SACU member states.

Table 6: Regulations in energy (electricity)

Country	Role players	Regulation	Competition
Botswana	Generation, transmission and distribution is the sole responsibility of the BPC.	No regulator. Regulation and tariff setting are vested with the Ministry of Minerals, Energy and Water Affairs.	IPPs are allowed, but there is no generation, wholesale and retail competition – i.e. there are no IPPs at all.
Lesotho	The Lesotho Highlands Development Authority is the sole generator, whereas the LEC is the sole transmitter and distributor.	The LEA exercises regulation and tariff setting.	IPPs are allowed, but there is no generation, wholesale and retail competition.
Namibia	NamPower is the sole generator and transmitter. There are also five government-owned regional electricity distributors.	The Electricity Control Board (ECB) oversees regulation, tariff setting and licensing.	IPPs are not yet allowed and there is no generation, wholesale and retail competition.
South Africa	Although there are some other independent generators, Eskom is the largest generator and transmitter. Distribution is undertaken by state-owned regional electricity distributors.	NERSA sets the regulatory framework and oversees tariff setting and licensing.	IPPs are allowed, but there is limited generation competition. There is no wholesale and retail competition.
Swaziland	SEC is the sole generator, transmitter and distributor.	The Ministry of Energy regulates the activities of SEC and also oversees tariff setting and licensing.	IPPs are allowed, but there is no generation, wholesale and retail competition.

Sources: Eskom, NERSA, LEC, LEA, SEC, ECB, BPC and NamPower websites.

Market access

Competition in generation, transmission and distribution is virtually non-existent in all member states. Namibia, for example, has repeatedly issued assurances that private entities will be allowed to participate in regional electricity distribution. However, progress on this has ground to a halt. South Africa allows IPPs, but its policy regarding incentives, priorities and prices has not yet been finalised. And the tender for base load capacity of between 2 100 MW and 4 500 MW from IPPs has been on hold for some time. Furthermore, Eskom's status as the sole buyer of all electricity generated in South Africa discourages competition. For a country that is targeting 30% of new electricity generation to come from IPPs, this 'significantly limits the opportunity to find alternative markets and brings into question the longer term success of the SAPP market mechanisms and regional competition'.[43]

The present regulatory framework in both Lesotho and Swaziland supports the entry of IPPs into those countries' electricity market. The latter is the only country that has privatised its state-owned electricity-producing company by changing it from a parastatal to a company registered under Swaziland's Companies Act. Whether this change has benefitted the electricity sector in Swaziland is open to debate.

Nonetheless, rapidly growing national and regional electricity demand is forcing governments to look to IPPs, or combinations of IPPs and state-owned utilities, to augment supply. For example, in Botswana, CIC Energy, an IPP, is on the verge of implementing the Mamabula power plant. In Lesotho, a South African-based firm, Netgroup, has shown interest in wind power generation at Letšeng-la-Terae in Mokhotlong and an Indian firm, Tarini, has expressed interest in harnessing the hydroelectric power potential of Oxbow.[44]

Notwithstanding the importance of IPPs, a study by the UN Economic Commission for Africa (UNECA)[45] shows that private sector involvement in the electricity sector is not the ultimate solution. Empirical evidence in Kenya and Ghana shows that the involvement of IPPs led to an increase in tariffs. This was attributed to the fact that the IPPs were invited to operate on an emergency basis, thereby escalating costs, and that the licences and contracts issued to them appeared 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 licence and PPA was renewed for a much longer period.

Therefore, issuing long-term licences and PPAs can ensure that the selling price of electricity by IPPs is moderated. This is essential, because longer term agreements allow for sufficient time for the investor to pay off project financing debts and provides an adequate amortisation period for the equipment.

Furthermore, market access should not be at the expense of or marginalise local private investment in the sector by placing much emphasis on large-scale investment. As pointed out in the section entitled 'Renewable energy', above, the potential exists for local private investment using decentralised energy systems based on small hydroelectric-, wind-, solar- and bagasse-based co-generation if the entry requirements can be designed to accommodate local investors.

For the purpose of security of supply and to prevent anti-competitive behaviour among IPPs, there is a need to introduce a policy that will guide and stipulate the parameters to be adhered to by IPPs. Leading the process, South Africa has recently released its draft IPP legislation, which sets out the regulatory framework within which IPPs will play a role in the electricity sector.[46]

Tariffs

Across SACU member states, the cost of supply differs enormously among different customer categories. The common denominator is that the cost of supply is lowest for industrial users, whereas that to residential users, on the other hand, is significantly higher. One of the reasons for this discrepancy is that smaller customers (as a ratio of total consumption) tend to use more electricity in the more expensive peak periods and have a poorer load factor[47] than larger customers. Furthermore, more electrical networks have to be built, maintained and operated to supply smaller customers than those that are required for larger customers on higher voltage networks.

Table 7 shows the electricity tariffs that various consumers face in the countries in SACU.

Table 7: Customer electricity tariffs in SACU member states (ZAR[a])

Country	Customer	Fixed charge	Energy charge
South Africa	Domestic	2.05	0.45
	Small business	5.49	0.38
	Large business	5.49	0.38
Botswana	Domestic	12.86	0.46
	Small business	34.45	0.53
	Large business	34.45	0.25
Namibia	Domestic	3.50	0.70
	Small business	3.50	0.70
	Large business	4.50	4.00
Lesotho	Domestic	–	0.57
	Small business	–	–
	Large business	–	–
Swaziland	Domestic	8.72	0.46
	Small business	8.72	0.61
	Large business	8.72	0.24

a = South African rand.

Sources: Eskom, BPC, NamPower, LEC, SEC.

When carrying out a comparative analysis on the costs presented in Table 7, it becomes evident that it is not so much the actual energy charges that differ among the utilities, but rather other components of the total cost, such as the fixed cost. Thus, while the use of energy is relatively cheap, it is more costly in other countries due to high service and administration charges. This matches with a priori expectations, as most of the energy utilities in SACU import their electricity from Eskom.

As such, the service and administration fees are higher due to extra costs involved in transmitting the electricity, e.g. wheeling charges. Another possible reason why energy costs are lower for Eskom customers is partly due to the source of energy used to generate electricity. A vast majority of Eskom's electricity is generated from coal, which is a far cheaper method of generating electricity, while NamPower, on the other hand also generates electricity through hydro and diesel, which are more expensive. In considering fuels and gas used to generate electricity, the volatile price fluctuations that they exhibit must be taken into account. The rise in commodity prices, despite their recent fall (late 2008 and most of 2009), can increase the cost of generating electricity from fuels or gas.

One must also keep in mind how a country balances its interests of self-sufficiency in energy generation with its willingness to import power.

Furthermore, the impact of capital costs from constructing power stations must also be taken into account when undertaking a comparative analysis of electricity tariffs. Drawing information from the National Integrated Resource Plan and various documents produced by the SAPP, one can deduce that the cost of building hydropower stations is significantly greater than building coal-powered stations for SACU countries. As such, countries that do not have an abundance of coal have little choice in generating electricity from other sources. They often find that not only will the costs of production be relatively higher, but the initial capital cost associated with the construction of these power stations will also be higher.

Energy taxes could be a factor in the pricing of electricity, however utilities often contract out of any additional costs or tax. They are charged VAT for the electricity they import however this is claimed back at the financial year end. As such, energy taxes are not an important component of the electricity tariffs charges that ultimately affect the final consumer, neither is domestically produced or imported electricity taxed differently, which would indicate no evidence of discriminatory pricing policies.

Another important factor that contributes to the tariffs is wheeling charges, which are defined as an amount charged by one electrical system to transmit electricity to, and for, another system or systems. When focusing specifically on those power utilities whose countries are members of SACU and charge other utilities in SAPP, one sees an interesting story developing. Out of those SACU power utilities that wheel, Eskom appears to be the most discriminating. The information from the table of wheeling charges (see Table 8 in Annex 1) shows that Eskom's charges to the power utilities are ranked from highest to lowest as follows: NamPower, LEC, HCB and SEC. While this initially shows that Eskom gives preferential treatment to its fellow SACU members, there are certain agreements in place that are worth investigating. One example is the wheeling charges that BPC charges Eskom. These charges are lower than BPC charges any other utility in the SAPP. One of the reasons behind this is that Eskom partially funded the building of the power lines used in the transmission of electricity and, as such, it faces substantially lower wheeling charges. Further investigation would yield a more effective understanding of the decisions behind these wheeling charges. In fact, it is common to see how some wheelers charge different sets or individual and it often depends on the origin of the import. For example, ZESCO as a wheeler charges all utilities the same price of ZAR 0.68 per kilowatt hour (kWh); this is because all the electricity that is transmitted via it comes from or goes to SNEL in the DRC. The same goes for SEC, which wheels for EdM and charges a standard rate of ZAR 0.16/kWh.

It is evident from the data on wheeling charges that the STEM wheeling charges are exactly half the cost of the wheeling charges for the bilateral agreements (see Table 9 in Annex 1). This is to promote trade in the region without any reliance on bilateral trade agreements. Ultimately, this information shows that wheeling is not a significant cost facing utilities. As such, it brings no further incentive to investors to invest in the construction of assets to be used for the production of electricity, since there does not appear to be a cost-effective methodology used in the calculation of these charges.

The price of electricity among SACU member states is unsustainably low and does not reflect the true cost of producing, transporting and distributing electricity, and includes

varying degrees of subsidisation.[48] Given the low reserve margin and the pressing need to invest significantly in new electricity generation capacity, member countries have decided to move towards economic pricing of electricity. In this regard, through SAPP, member states commissioned a study to reassess tariff-setting principles and related applied tariffs and electricity pricing in the region.[49] The study was completed in 2008, but its findings have not yet been made public.

Although increasing power tariffs over time to boost electricity supply and attract investors might be considered a positive move, member states would also have to implement economic reforms to cushion the possible inflationary impact of increasing the tariffs and the impact on governments' endeavours to promote universal access to electricity. Where tariff increment is critical, a phased-in approach could be followed.

To avoid investment polarisation, SACU member states, under the auspices of SAPP, should also endeavour to harmonise electricity tariffs. The first steps towards this include determining what types of internal network pricing models are compatible with increased trade and improved network service quality. Location-sensitive pricing for network capacity and services should be investigated. The harmonisation of the accounts of the various utility companies is a necessary condition for any harmonisation of tariff principles. Currently, the financial accounts of the various electricity companies are based on differing principles, methods and base years.[50]

We should also point out that tariffs are just one of a host of other concerns IPPs will consider in their investment decision. Other factors such as the market and economic size, access to finance, PPAs, the political and economic stability of the host country, a transparent and consistent policy and regulatory framework, and socio-economic aspects are also vital in their decision making.

SADC Energy Protocol

In 1998 the SADC Energy Protocol came into operation when all the SADC countries, with the exception of the DRC, Mozambique and the Seychelles, signed an agreement on cross-border co-operation in the energy sector, specifically on regional energy activities.[51]

The protocol defines the legal basis and policy framework for energy co-operation in the region. Four priority areas are identified as energy trade, information and experience exchange, training and organisational capacity building, and investment and funding. However, nowhere in the actual document are guidelines set out for the generation, distribution and transmission of energy. What the protocol does provide for fairly extensively is a regulatory framework with regard to the development of energy technologies and the sharing of information or energy data. However, one of the objectives for energy co-operation in the region is the provision of 'reliable, continued and sustainable energy services', taking into account the costs it could have on people and thus minimising this.[52] The protocol does not recommend any strategy on how this objective could be achieved.

HARMONISATION AND LIBERALISATION

The lack of coherence on several issues in SACU has been identified as a hindrance to the prospects for meaningful regional economic co-operation. For instance, the lack of harmonisation of services regimes has been blamed for the unwillingness and/or inability of SACU, especially South Africa, to engage third parties, such as the European Union (EU) on the Economic Partnership Agreement (EPA) negotiations. Harmonisation can therefore be used as a tool to consolidate SACU's negotiating powers in its dealings with other economic groupings and in helping it reduce prospects for its marginalisation from the global economy.

The lack of convergence on energy policy has also restricted complementarities in economic development in the region. The acute polarisation of economies of scale in the region and the dominance of South Africa, as the largest and most competitive economy in Africa, skews foreign investment in that country's favour and makes it almost impossible for the other SACU member countries to be competitive.

It is precisely for this reason that harmonisation must be undertaken to spread capital efficiently across the entire region and avoid 'a race to the bottom' as countries compete with one another to attract investments and promote economic development in the region. Harmonisation will thus ensure that consideration of investment location will be at the regional level. However, care must be taken to ensure that harmonisation, when it is formulated, is not in terms of the lowest common denominator, as there is no merit in harmonisation if it results in the adoption of legal concepts of the least progressive member(s) in SACU or if small countries are locked into large countries' regulatory standards. This issue is linked to the question of which is the best 'law' or regime in SACU to follow. As there is no country in SACU that can authoritatively dictate the best law that SACU should adopt, the question is, should SACU engender a new corpus of standards or should it aim to adopt international standards?

As such, harmonisation is crucial to strengthening regional activities and deepening regional integration. Such an exercise undertaken with the needs of the region in mind can be tailor made to compel SACU countries to conform to a set of common operating conditions working towards a common objective, which can, for instance, be the promotion of a particular economic agenda in SACU or a regime tailored to help meet its objectives. However, the unwillingness of individual member states to give up sovereignty for a future common good has been the central challenge to regional integration efforts the world over — this is not an exception with SACU member states.

Though the SACU Agreement does not cover the liberalisation of trade in services, SACU member states have engaged in services trade liberalising activities primarily through unilateral policy measures, whether bound in the WTO's GATS or not, and through implementation of a range of SADC protocols.

When SACU member states acceded to the SADC Treaty as amended in 1992, they signified their willingness to observe certain regionally agreed principles, objectives, and strategies on co-operation and integration.

It is in this regard that SACU's vision relating to energy infrastructure development is premised on the implementation of the SADC Energy Protocol. The protocol commits SACU member states to the development of a harmonised regional energy policy.[53] The overall objectives of the protocol are to foster harmonisation of national and regional

energy policies. The core strategies for achieving this are through the encouragement of regional energy trade, energy investments and funding, as well as capacity building, training and information exchange.[54]

All SACU members have ratified the protocol and, by so doing, have committed themselves to harmonising their energy policies.

Current plans for harmonisation and liberalisation

Significant measures have been taken to implement the provisions of the SADC Energy Protocol. These efforts include the following (covering both current and envisaged projects).

Current and future expansion plans and interconnections

SAPP Power Market Plan

This plan's objective is to help promote regional multi-country competitive electricity trade in order to foster regional integration and economic development.

Central to the plan is STEM — introduced in 2001 as a precursor to a fully competitive market. STEM complements the existing long-term bilateral contract among members, but it is increasingly viewed as a first stage towards full competitive electricity trade in the region. However, not all SAPP members participate in STEM, as there are only eight participants, namely: BPC, Eskom, EdM and HCB, Kariba North Bank, NamPower, SEC and ZESA.

SAPP is currently testing a more competitive system, where prices will be set based on demand and supply between member utilities. It is envisaged that this will encourage real-time trade of electricity and thereby reflect its true price. There is hope that this system will help investment to come in both transmission and generation. The system is expected to go live in October 2009.[55] However, the effectiveness of this system will likely be constrained by the availability of tradeable energy, at least in the short to medium term.

The Western Power Corridor Project

This is a special purpose vehicle (SPV) conceived through the combined initiative of the power utilities of Angola, Botswana, the DRC, Namibia and South Africa. The project's aim was to harness the large water resources of the Congo River at Inga in order to produce and supply electric power, initially for the five countries involved, but ultimately to the whole Southern African region.[56]

However, at the time of the present research, there were conflicting reports regarding the involvement of the SPV in the Inga project. One report stated that the SPV was to withdraw from the Inga project due to the fact that the DRC decided to develop the project on its own and the SPV was to pay attention to potential sites along the Zambezi, Intombi, Kunene and Cuanza rivers for hydropower development (same source as in the report). Another report, in contrast, reaffirmed that the Inga project will still proceed under the auspices of the SPV, with additional SADC member states.[57]

Transmission expansion plans

A number of priority projects that would enable the exchange of electricity to improve system economy have been identified. These include several interconnectors to counter

the situation where some countries are not linked to the SAPP network. For example, currently Angola, Tanzania and Malawi are not connected to the SAPP network and are therefore not in a position to participate in the power pooling arrangements. Notable transmission projects include the following.

- **Second 400 kV Zimbabwe–Botswana–South Africa interconnector:** The aim of this interconnector is to increase the capacity of the existing interconnector up to 650 MW by constructing a second line from Insukamini substation in Zimbabwe via Phokoje substation in Botswana to Matimba substation in South Africa. The project is still at the feasibility stage.[58]
- **Second Mozambique–Zimbabwe interconnector:** The purpose is to construct a second 400 kV interconnector from Songo substation in Mozambique to Bindura substation in Zimbabwe. This is expected to transfer up to 500 MW of power. The project is still at the feasibility stage.[59]
- **Zambia–Namibia interconnector:** Commissioned in 2008, the project aims to interconnect Zambia to Namibia at 220 kV and involves a 231 kilometre line from Zambia feeding into the northern part of Namibia in the Katima Mulilo area. Construction of the Zambia–Namibia line is currently under way.[60]
- **Zimbabwe–Zambia–Botswana–Namibia interconnector:** The planned $225 million transmission line will link the four respective countries' electricity networks. Estimated to transmit 600 MW around the region, it is envisaged that this would reduce congestion on the central transmission corridor. The transmission line is scheduled for completion by 2010.[61]

Harmonisation issues and institutional mechanisms

Regional Electricity Regulatory Association of Southern Africa

Launched in September 2002 in Windhoek, Namibia, the overall objectives of this body are to facilitate the operation of the national electricity regulators to exchange information on their activities, identify areas of common interest and engage in regional co-operation in electricity regulation by, among other things, building regulatory understanding, capacity and skills among regulators and other entities with regulatory responsibilities; promoting the timely creation and establishment of regulators in countries where they presently do not exist; assisting the harmonisation of legal and regulatory systems and practices governing electricity markets in the region; and undertaking the economic regulation of electricity interconnection and trade among SADC member states.[62]

The Regional Electricity Regulators Association of Southern Africa (RERA) has eight members, namely, Angola, Lesotho, Namibia, Malawi, South Africa, Tanzania, Zambia and Zimbabwe. Botswana and Swaziland are not members. While it can be argued that the reason for Botswana not being a member is because of that country's non-existence of a regulator, it is not clear why Swaziland is not a member.

While RERA promises improvements in the areas of uniform regional standards regarding access to networks, wheeling charges, and related technical issues that ease the wheeling of power over different networks, progress to date seems to have been slow. The limited resources at RERA's disposal remain a major constraint and continue to hamper the implementation of some of the planned projects and activities. Its major challenge is

to enhance its institutional capacity and develop a multi-year strategic plan that is able, among other things, to ensure the continued commitment and involvement of members and other relevant stakeholders in implementing its work programmes; and to accelerate the establishment of regulators and the harmonisation of the regulatory environment in the region.

Regional energy efficiency

This project is still in its infancy. Once fully developed and implemented, it is expected that it will reduce the overall demand-side electricity utilisation of the region's utilities. SAPP is currently establishing areas of common interest and defining the role to be played by member utilities in achieving energy efficiency within the region.[63]

Investment incentives

In its 2008 annual report,[64] the SAPP Executive Committee proposes that countries in the region should consider the adoption of investment incentives directed at possible domestic and foreign investors in the sector. The committee further recommends that the adoption of such incentives should be supported by addressing policy issues relating to legal and regulatory frameworks in order to ensure a conducive business climate, and value-added tax (VAT) and other tax exemptions should be extended to imports of energy-related capital equipment for a defined period.[65] However, the committee's recommendations on investment incentives are silent on how these would be financed by the countries concerned and whether this will have an effect on member countries' investment legislation.

Liberalisation

Multi-stakeholder participation in SAPP

In 2006 SAPP member states signed the Revised Inter-Governmental Memorandum of Understanding in Gaborone, Botswana. Because of this amendment and apart from the national power utilities and IPPs, other stakeholders such as independent transmission and load-serving companies can now participate in SAPP activities. However, regimes such as South Africa's single buyer do not positively contribute towards this objective.

While SAPP can certainly provide benefits for the region, it cannot provide all the answers to the region's electricity challenges. In particular, SAPP is not a market maker for electricity trading; it can only facilitate. Its optimal use will always be constrained whenever there are regional electricity shortages. Furthermore, SAPP lacks authority and has no powers insofar as standards enforcement, initiation of new projects or application of harmonised regional tariff structures are concerned. Lastly, IPPs may not see the benefits of being SAPP members or sell via SAPP when they can conclude off-take agreements directly with potential customers.

WTO GATS commitments of SACU countries

WTO members have undertaken limited commitments in the area of energy services, including electricity services. Some of the reasons provided for this include the unwillingness of state companies to give up their monopoly status and the lack of a clear definition of what is meant by energy services. Consequently, the current discussion at the WTO is centred

on the issue of classification, with some members making the development of adequate classification a prerequisite to undertaking any further commitments in the sector.[66]

No commitments have been made by SACU countries in electricity services. However, it would appear that the first task of a regional energy services liberalisation process would be to define and categorise the services to be subject to liberalisation — considering that there is no clear notion of what is understood by the term electricity services.

TOWARDS A NEGOTIATING STRATEGY

Negotiations on the liberalisation of trade in services are taking place in different forums and at different levels (bilateral, regional and multilateral). All negotiations are, however, interrelated, since commitments adopted at one level influence developments in others, making the whole negotiating process rather complex. The higher the level of commitments adopted in the multilateral framework and the wider their scope, the smaller is the space left for preferential liberalisation to take place in the framework of bilateral or regional agreements. Members of subregional integration agreements therefore need to determine a common position as to the subsectors in which access to electricity services by domestic and foreign service providers could have the greatest positive impact on their respective economies and development goals.

WTO provisions in electricity services trade

WTO agreements that are directly relevant to cross-border electricity trade include the General Agreement on Tariffs and Trade (GATT), GATS, the Technical Barriers to Trade Agreement, the Agreement on Trade-Related Investment Measures (TRIMS), the Subsidies and Countervailing Measures and the Agreement on Government Procurement. The WTO principles that govern international trade, including trade in electricity services, are contained in the following provisions of the various aforementioned WTO agreements.

Most-favoured nation principle

Under Article I of the GATT, the most-favoured nation (MFN) principle means that similar energy products cannot be discriminated against on the basis of their origin or destination. Furthermore, discriminatory measures such as customs duties and regulations that might confer any advantage on energy products from a certain country should be extended to similar products from any other WTO member.[67]

National treatment principle

The national treatment principle is relevant to domestic taxes, laws and regulations requirements that discriminate against imported goods. With respect to electricity services, for example, imported electricity shall not be subjected to internal taxes greater than those for similar electricity of domestic origin.[68]

Quantitative restrictions

Article XI of the GATT prohibits quantitative restrictions other than duties, taxes or other charges from being imposed by a country on either imports or exports. Quantitative

restrictions include measures such as quotas and import and export licences that directly affect trade volumes. The logic behind this prohibition is that tariff measures are less distortional compared to quantitative measures. However, Article XI allows certain exceptions on a provisional basis (the article is silent on the specific time for which the exceptions will be valid). The most relevant exception with respect to electricity services is the provision that allows countries facing critical shortages of products considered essential to temporarily impose export quotas in order to relieve such a situation.[69] This is the case with South Africa, which has reduced the amount of electricity exported to certain SAPP member states due to domestic shortages.

Exceptions

WTO members who are pursuing certain policy objectives such as human, animal, life or health protection or security interests can make use of Article XX exceptions. It is important that such measures do not contain disguised restrictions on international trade, especially where similar interests prevail.[70]

Market access

Articles VIII and IX of the GATS contain provisions that focus on the conduct of monopolies and exclusive service suppliers and business practices. The former requires that suppliers do not abuse their monopoly position in the supply of services in a manner inconsistent with the MFN principle and with the members' specific commitments.[71]

Transit

Article V of the GATT provides for freedom of transit: 'there shall be freedom of transit through the territory of each member, via the routes most convenient for international transit, for traffic in transit to or from the territory of other members'. Electricity supply often takes place via transmission networks, and sometimes these networks cross third countries in transit, as is the case in SAPP. Based on Article V, electricity in transit cannot be subject to customs duties or any other charges. However, countries are allowed to levy charges related to the cost of transmission or other services rendered in the course of transmission.[72]

The MFN principle also applies to transit, meaning that there should be no distinction in treatment based on destination; the place of origin, departure, entry and exit; or any circumstances relating to the ownership of electricity.

Technology transfer

Article 7 and Article IV(1)(a) of the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) and the GATS, respectively, both provide for the promotion of technological innovation and the transfer and dissemination of technology. Article 66(2) of the TRIPS goes further and requires developed countries' governments to provide incentives for their companies to transfer technology to least-developed countries in order to enable the latter to create a sound and viable technological base.[73]

Technical assistance and capacity building are very important for the transfer of technology in the electricity sector, especially with respect to renewable energy technologies. One example of encouraging technology transfer to local service providers might be a requirement for foreign service providers to form joint ventures with local service providers.

However, corresponding domestic intellectual property rights legislation that guarantees intellectual property protection and the local absorption capacity are also as important.

Subsidies

As global environmental concerns escalate, some measures have been introduced by governments that allegedly could be inconsistent with WTO subsidy rules. These relate to both export subsidies and subsidies contingent upon the use of domestic products over imported products. The Subsidies and Countervailing Agreement prohibits such measures. With respect to electricity, some pricing policy practices in SACU countries can be contested on the basis of subsidy disciplines.

Overview of barriers to trade in electricity services

Barriers characteristic of the electricity services sector include the following.

Energy taxes and border tax adjustments

It is WTO consistent to subject products imported into a country to the same taxes as domestic products. Article II(2)(a) of the GATT explicitly recognises the right of members to impose a charge equivalent to an internal tax in respect of the like domestic product or in respect of an article from which the imported product has been manufactured in whole or in part.[74]

However, in pursuing environmental goals, countries could impose high energy taxes on imported electricity produced using environment-degrading technologies. This appears to be complicated if final goods possess identical physical characteristics and have the same end use (e.g. electricity generated by coal or renewable sources).

Pricing and subsidies

Regulation of prices within the region has a trade barrier impact on the cross-border supply of electricity. This means that generators of electricity may not be able to sell electricity at a price that is sufficient to cover their generation costs, and this will affect their investment return. Where price controls are too rigid, this can be a deterring factor for IPPs that intend to establish a commercial presence.

Electricity pricing is also a perceived barrier that stems from the region's historically low unit price of coal and electricity, although there has been a gradual and incremental rise in electricity prices over recent years. This barrier still holds strongly in the mind-set of many potential investors, who argue that large-scale investments cannot be justified due to the lengthy paybacks involved.

Still, it is to be noted that the regulation of prices is central to universal access policies, as price is one of the factors that affect access to electricity for predominantly poor consumers. In this regard, the region will have to establish a balance between the need to expand generating capacity and the need for universal access.

Furthermore, in a large and diverse market such as SAPP, there are bound to be important regional and location differentials in the cost of supplying electricity. However, the entire pool will work at less than optimal efficacy if subsidies distort prices for trade and discourage needed network investments. On the other hand, IPPs will be reluctant to invest in a network capacity that is poorly recompensed.

Lastly, it will be challenging to halt the subsidisation of electricity to consumers in SACU countries for a number of reasons, including the consumers' perception of electricity as a right of citizenship; anticipated short-term impacts on heavy users who have adapted their operations to the subsidies; and the lack of political will to bring an end to subsidies.

Technical regulations and standards

With the increasing awareness of the effects of pollution, such as global warming, it becomes critical for governments to impose mandatory requirements concerning the composition of electricity generation processes. Some of the requirements include, for example, environmental standards that set the maximum allowed pollution levels from electricity generation or the incorporation of a certain technology that is produced domestically. These requirements are viewed as technical regulations. These regulations should not discriminate against imported electricity and only be in favour of domestically produced electricity. In this instance, they will be viewed as technical barriers to trade.

SACU member states will have to guard against this, because, as environmental requirements become an integral part of licence and tariff approval conditions imposed by member states' regulators, these technical regulations will evolve.

However, the Agreement on Technical Barriers to Trade allows exceptions for technical regulations and standards that fulfil certain objectives, including protection of the environment and human health.

Investment

Trade-related investment measures likely to be encountered on energy services are local equity and content requirements, export, and transfer of technology requirements. Under the TRIMS Agreement, the most prominent measure would be local content requirements, which are prohibited under this agreement.[75]

Market access

Besides market access to power generation opportunities, trade in energy is often obstructed by difficulties in getting access to transmission and distribution networks. Transmission network owners may refuse other parties access to submit or wheel electricity through their networks, subject to such owners being paid a fair amount for the use of their networks. In SACU, transmission networks mostly belong to government-owned utilities. Without access to these networks, IPPs (especially smaller IPPs that do not necessarily have the capacity to negotiate separate agreements with government) will not be able to supply markets. Moreover, legislation that gives utilities overriding dominance serves as a barrier. For example, the single purchaser model as practised by Eskom in South Africa does not favour market access, unless, of course, Eskom were a champion of IPPs, which does not seem to be the case.

Negotiating strategy and modalities

Defining the most appropriate forum to liberalise services is not an easy task. Deciding on the optimal level to carry out services liberalisation within a regional grouping with different levels of economic development is a critical issue. For some subsectors, the

regional level may well be the most appropriate and realistic level of liberalisation and the one that makes sense in terms of negotiating effort, while for other subsectors, the multilateral level might be the optimal one.

There has been a move towards harmonisation in the region. This is beneficial for the attraction of investment, as a larger market is created. Regional rules and regulations, for instance on investment incentives, would also make the region more attractive for investors. However, any regional initiative implies heavy negotiation costs to arrive at a common position. Experience has shown that this is a time-consuming process, which in turn reflects both limited capacity and different interests (e.g. because of different levels of income and economic development).

Although member countries do not need the GATS to liberalise their electricity services sector, it is worthwhile to mention that the GATS allows countries, especially developing countries, to table offers in sectors where market access by foreign services providers is considered to be most capable of having the greatest positive impact on the local economy. The GATS also allows countries to make use of performance requirements in order to ensure that the beneficial effects of such foreign presence are maximised. In this regard, commitments made at the GATS should be seen as an extension of the domestic strategy in order to meet national development goals.

With respect to electricity services, the challenge for SACU countries would be how to establish their specific needs in the framework of GATS Article IV (i.e. increasing their participation in world trade), leading to access to capital, transfer of technology and capacity building. For example, joint venture establishment requirements could be treated as a limitation on trade liberalisation.

The first task of a regional electricity services liberalisation process would be to define and categorise the services to be subject to liberalisation. The following section provides suggested negotiating approaches to electricity services.

Generation

The SACU region has considerable coal resources and hydroelectric potential that present attractive generation opportunities for the future. The region is facing chronic generation limitations and new investment is needed, and huge financing gaps for new power generation projects have been identified. Most SACU countries are already carrying out unilateral liberalisation, especially in the generation of electricity. The introduction of competition into the generation sector has the capability of leading to the least cost to the consumer and it might also mean that there is less pressure on the countries' balance sheets. Furthermore, the equity injected by IPPs into projects has the potential to increase the overall capital in the market.

The optimum level for liberalisation of such services is the largest market possible, in order to attract and accommodate investment from the most efficient service operators. Liberalisation restricted at the SACU level would limit the ability of the countries to draw upon the most efficient suppliers and maintain higher cost services. Member states should therefore consider a mixture between bilateral (through the EPAs) and multilateral (through the GATS) liberalisation. There should be conscious multilateral liberalisation until regional capacity has been built up in the sector. The crucial strategy would be to attract investment in and technical assistance for power generation.

Currently, there is limited coverage of generation services under the GATS, and it does not appear as though there would be any major obstacles to member states making commitments while attempting to preserve preferences in the regional (and domestic) markets.

Transmission and distribution

Similar to generation, transmission and distribution require large amounts of capital to operate and large economies of scale to carry out. The optimum level for the liberalisation of such services is also the largest market possible, in order to attract and accommodate investment from the most efficient service operators. Liberalisation restricted at the SACU level would limit the ability of member states to draw upon the most efficient suppliers and thus maintain higher cost services. Again, a mixture of the GATS, EPAs and regional preference is the most economical and beneficial forum for liberalisation. The effort should focus on increasing the participation of the private sector and improving the regulatory structures so that investment and technical assistance can help improve the capacity of the subsector. This should also be supported by relevant regulations in the subsector.

Furthermore, coverage of transmission and distribution services under the GATS is very limited, and it does not appear that there would be any major obstacles to member states making commitments while attempting to preserve preferences in the regional (and domestic) markets.

Renewable energy

Vast potential in solar PV cells and a range of other technologies such as wind, small hydroelectric facilities and biomass exists in the region. This potential can, however, only be realised when governments partner with the private sector domestically, regionally and internationally. At the regional level, there are a number of advantages, including the development of co-operation among participants, especially in the area of research and development.

It is suggested that SACU member states formulate national renewable energy policies and strategies that go beyond rural electrification programmes, and that these are harmonised at the SACU level. The strategy should be able to identify, among other issues, key barriers to trade in renewable energy services in the region, tariff settings and standards harmonisation, financing, and so on. It is only after this has been done that the countries would be in a position to make a rational commitment to the GATS. It is suggested, therefore, that they participate in the GATS negotiations on renewable energy services as observers.

Possible preconditions

To ensure that market access will contribute to domestic and regional development goals, access to the region's electricity markets could be made conditional on (1) technological transfer and capacity building, and (2) the establishment of joint ventures between foreign and domestic service providers. The latter should conform to the TRIMS provisions. These preconditions could be included as negotiated additional commitments in the sector.

SACU could also try to get acceptance of the principle of no implementation of commitments without the fulfilment of preconditions happening first. Other preconditions might include a sectoral development plan.

Sequencing and timing

Sequencing and timing is also important in the successful liberalisation of electricity services.

We suggest that the decision should be taken on the basis of which subsectors countries regard as priorities: it is important to accept the reality that priorities in electricity services differ from one member state to another. Perhaps the starting point should be to focus on the subsectors in which most member states are interested. For example, it might be possible to liberalise generation, transmission and distribution in the first instance and leave renewable energy services to a later round.

Having established a common basis for sequencing subsector liberalisation, SACU member states should commit themselves to the timing of future liberalisation measures in their schedule of commitments. This has the potential to lock in domestic reform of electricity services in member states.

Technical support and consultation

Database development

Article 6 of the SADC Energy Protocol rightly points out that 'Member States agree to set up a regional energy data base to facilitate the exchange of information among institutions and in order to facilitate regional energy policy formulation and planning'.[76]

However, there is no single centralised electricity database. When data is available, values often vary from one source to another. SACU, under the auspices of SAPP, needs a monitoring process that ensures proper connections among the sources/repositories of information and supports an ongoing stable, reliable and predictable information exchange.

Ideally, there is a need for regular data updates and trend analysis that interprets the information gathered. There are various repositories of very useful and relevant information (e.g. SAPP, energy utilities and government ministries). What is lacking is a nodal point where a model database accommodating cross-SACU and cross-electricity services sectors data can be housed. Such data should be current and therefore should be updated on a quarterly basis. Ownership of the database should vest with all participating repositories of source information, and the information should be widely disseminated through vehicles such as an 'energy database' website. The regular updating of the data will facilitate the ongoing enrichment of the database and the validation of the information that it contains.

The participation of existing repositories of information such as SAPP and national utilities will not present an add-on, but would be a logical extension of their already existing functional profile. The assignment of a nodal point to consolidate and package the data comparatively will add value to the harmonisation, implementation, operations and monitoring undertaken by each of the participating repositories.

It is recommended that consideration be given to developing a model database to assist with electricity services sectors' performance monitoring. As such, the database needs to be multi-purpose and responsive to the planning needs of national governments and investors. As Bushnell once stated: 'When we make major policy decisions about important industries, it helps to know what is going on in those industries. High quality, publicly available data is critical for our understanding of how these industries work and continue to evolve.'[77]

Technical support

Article XXV of the GATS makes provision for technical assistance to developing countries. With respect to electricity services, SACU should place emphasis on technical support for both regulatory design and ongoing regulation capacity. It is apparent that the realisation of market access benefits would depend on effective domestic regulation. Hence, RERA has a critical role to play in this regard. Technical support can also be complemented by working jointly with other capacity-building institutions such as UNECA, the African Development Bank and the US Agency for International Development.

Consultation

Interaction among all major stakeholders during these processes is a key factor. Public and private stakeholders in the electricity sector must be involved in the consultations and a consistent, formal channel of interaction established.

Furthermore, IPPs do not have a cohesive voice to represent the interests of the industry. South Africa is considering creation of a new IPP association that will include IPP companies, industry and, perhaps, regulatory agencies.[78] This should be extended to other SACU member states.

CONCLUDING REMARKS

Electricity is arguably the most dynamic of all energy products. It provides a wide variety of services, including light, heat, powering electronics, etc. The development of a country's electricity sector is a crucial precondition for broader economic growth and for overall economic and social development. Unfortunately, the electricity sector in SACU member states is facing chronic challenges, including lack of surplus capacity and underdeveloped power transmission and distribution infrastructure. Consequently, their economies have been experiencing high electrical power system losses, extreme voltage fluctuations and intermittent power outages that cause equipment and material damage, leading to losses in production. Hence, electricity's contribution to the high cost of doing business in the region is rising.

Traditionally, power utilities in the region have enjoyed a monopolistic hold over their national electricity industry. There is a growing consensus that the monopoly has contributed to underperformance in the delivery of electricity services. The scale of capital requirements for new projects and the pressure this could place on countries' balance sheets have elevated the importance of private participation in the sector. Hence, the general response to the unfolding crises has been to increase generation, transmission and distribution capacity by leveraging private investments, including independent power producers.

Yet in most countries in the region, IPPs have not gained much footing. Part of the reason is that regulators generally are not politically powerful enough to take on state-owned monopolies. The single purchaser model as practised by Eskom in South Africa, for example, provides the utility with excessive power and discourages market access. Furthermore, the lack of political will to commit to private sector involvement versus public sector goals affects whether significant private investment becomes a reality or remains an elusive target. For example, political considerations often drive the setting

of prices in the consumers' favour, hampering private sector involvement and new investments. Namibia, for example, has repeatedly given assurances that private entities will be allowed to participate in electricity distribution. However, progress on this has ground to a halt.

Electricity pricing is also a perceived barrier that stems from the region's historically low unit price of coal and electricity, although there has been a gradual and incremental rise in electricity prices over recent years. This barrier holds strongly in the mindset of many potential investors, who argue that large-scale investments cannot be justified due to the lengthy payback time involved. The most pressing issue across all SACU member states (with the exception of Lesotho) is the failure of electricity providers to recover full generation, transmission and distribution costs. The prevalence of subsidies has been largely blamed for this.

Furthermore, it has been suggested that to avoid 'a race to the bottom' as countries compete with one another to attract investments and promote economic development, the harmonisation of energy policy and regulatory frameworks is essential. There is no doubt that regulatory harmonisation could be very difficult in a sector where regulation is only directed at vertically integrated government-owned utilities. Still, the SADC Energy Protocol can be used to identify priority areas for regulatory harmonisation and mobilise regional efforts to address them, especially with respect to issues that cut across several subsectors in the electricity industry. Obviously, this is a tall order, but a necessity if a viable regional market is to be created and significant private sector involvement is to be realised.

The regulators in the region are still hindered by issues such as a lack of clear government policy and proper legislative frameworks to guide their participation in a competitive electricity market. These obstacles at the national level are replicated at the regional level, as IPPs seeking to supply power to other countries still encounter those countries' regulatory frameworks. If these challenges are not addressed, it will be of little use, for example, to have IPPs being able to compete internally in Swaziland while the real market is in South Africa, which is not accessible, because Eskom does not allow access to its networks. Consequently, RERA has a role to play in supporting national regulators to open up domestic markets and thereby enhance regional expansion in electricity trade.

Liberalisation in electricity services subsectors should be supported by an appropriate legal framework in order to prevent abuses in deregulated markets and protect domestic consumers, while ensuring transfer of technology and the development of domestic competitive supply capacities. Appropriate incentives such as lowering entry requirements and other tax exemptions should be enacted to encourage regional investment in the sector.

ANNEX 1: WHEELING CHARGES

Table 8: Bilateral wheeling charges, 1 January 2009–December 2009

Transaction: Seller to buyer	Wheeling charges, USc/kWh							Total cost USc/kWh
	BPC	Eskom	EdM	EdM/ HCB HVDC[a]	SEC	ZESA	ZESCO	
SNEL–ZESA							0.167	0.167
SNEL–BPC						0.173	0.167	0.340
SNEL–Eskom	0.004					0.173	0.167	0.344
SNEL–NamPower	0.045	0.237				0.173	0.167	0.623
SNEL–SEC	0.045	0.090				0.173	0.167	0.476
SNEL–LEC	0.045	0.181				0.173	0.167	0.566
SNEL–HCB						0.125	0.167	0.293
SNEL–EdM	0.045	0.124			0.003	0.173	0.167	0.513
ZESCO–BPC						0.173		0.173
ZESCO–Eskom	0.004					0.173		0.177
ZESCO–NamPower	0.045	0.237				0.173		0.456
ZESCO–SEC	0.045	0.090				0.173		0.309
ZESCO–LEC	0.045	0.181				0.173		0.399
ZESCO–HCB						0.125		0.125
ZESCO–EdM	0.045	0.124			0.003	0.173		0.346
ZESA–Eskom	0.004							0.004
ZESA–Eskom via HVDC[a]				0.294				0.294
ZESA–NamPower	0.045	0.237						0.283
ZESA–SEC	0.045	0.090						0.136
ZESA–LEC	0.045	0.181						0.226
ZESA–EdM	0.045	0.124			0.003			0.173
ZESA–SNEL							0.167	0.167
BPC–ZESCO						0.173		0.173
BPC–SNEL						0.173	0.167	0.340
BPC–NamPower		0.237						0.237
BPC–SEC		0.090						0.090
BPC–LEC		0.181						0.181
BPC–HCB						0.201		0.201
BPC–HCB via HVDC		0.272						0.272
BPC–EdM		0.124			0.003			0.128
Eskom–ZESA	0.004							0.004
Eskom–ZESA via HVDC				0.294				0.294

Eskom–ZESCO	0.045					0.173		0.218
Eskom–SNEL	0.045					0.173	0.167	0.385
Eskom–HCB	0.045					0.201		0.246
Eskom–SEC			0.009					0.009
Eskom–EdM					0.003			
NamPower–SNEL	0.045	0.237				0.173	0.167	0.623
NamPower–ZESCO	0.045	0.237				0.173		0.456
NamPower–ZESA	0.004	0.237						0.241
NamPower–BPC		0.237						0.237
NamPower–SEC		0.185						0.185
NamPower–LEC		0.185						0.185
NamPower–HCB via HVDC		0.389						0.389
NamPower–HCB	0.045	0.237				0.201		0.484
NamPower–EdM		0.224			0.003			0.227
HCB–SNEL						0.125	0.167	0.293
HCB–ZESCO						0.125		0.125
HCB–BPC						0.201		0.201
HCB–BPC via HVDC		0.272						
HCB–SEC	0.045	0.090				0.201		0.337
HCB–SEC via HVDC		0.244						0.244
HCB–LEC	0.045	0.181				0.201		0.427
HCB–LEC via HVDC		0.328						0.328
HCB–EdM	0.045	0.124			0.003	0.201		0.374
HCB–EdM via HVDC		0.307						0.307
HCB–Eskom	0.004					0.201		0.205
HCB–NamPower	0.045	0.237				0.201		0.484
HCB–NamPower via HVDC		0.389						0.389
EdM–SNEL	0.045	0.124			0.003	0.173	0.167	0.513
EdM–ZESCO	0.045	0.124			0.003	0.173		0.346
EdM–ZESA	0.004	0.124			0.003			0.131
EdM–BPC		0.124			0.003			0.128
EdM–LEC		0.192			0.003			0.196
EdM–HCB	0.045	0.124			0.003	0.201		0.374
EdM–NamPower		0.224			0.003			0.227
EdM–Eskom					0.003			0.003
EdM–SEC		0.075						0.075
SEC–SNEL	0.045	0.090				0.173	0.167	0.476
SEC–ZESCO	0.045	0.090				0.173		0.309
SEC–ZESA	0.004	0.090						0.094
SEC–BPC		0.090						0.090
SEC–NamPower		0.185						0.185

SEC–LEC		0.131						0.131
SEC–HCB via HVDC		0.244						0.244
SEC–HCB	0.045	0.090				0.201		0.337
SEC–Eskom			0.009					0.009
SEC–EdM		0.075						0.075
LEC–SNEL	0.045	0.181				0.173	0.167	0.566
LEC–ZESCO	0.045	0.181				0.173		0.399
LEC–ZESA	0.004	0.181						0.185
LEC–BPC		0.181						0.181
LEC–NamPower		0.185						0.185
LEC–HCB	0.045	0.181				0.201		0.427
LEC–HCB via HVDC		0.328						0.328
LEC–EdM		0.192			0.003			0.196
LEC–SEC		0.131						0.131

a = high-voltage direct current (HVDC).

Table 9: STEM wheeling charges, 1 January 2009–December 2009

Transaction: Seller to buyer	Wheeler charges, USc/kWh							Total cost USc/kWh
	BPC	Eskom	EdM	EdM/ HCB HVDC[a]	SEC	ZESA	ZESCO	
SNEL–ZESA							0.084	0.084
SNEL–BPC						0.086	0.084	0.170
SNEL–Eskom	0.002					0.086	0.084	0.172
SNEL–NamPower	0.023	0.119				0.086	0.084	0.311
SNEL–SEC	0.023	0.045				0.086	0.084	0.238
SNEL–LEC	0.023	0.090				0.086	0.084	0.283
SNEL–HCB						0.063	0.084	0.146
SNEL–EdM	0.023	0.062			0.002	0.086	0.084	0.257
ZESCO–BPC						0.086		0.086
ZESCO–Eskom	0.002					0.086		0.088
ZESCO–NamPower	0.023	0.119				0.086		0.228
ZESCO–SEC	0.023	0.045				0.086		0.154
ZESCO–LEC	0.023	0.090				0.086		0.200
ZESCO–HCB						0.063		0.063
ZESCO–EdM	0.023	0.062			0.002	0.086		0.173
ZESA–Eskom	0.002							0.002
ZESA–Eskom via HVDC[a]				0.147				0.147
ZESA–NamPower	0.023	0.119						0.141

ZESA–SEC	0.023	0.045						0.068
ZESA–LEC	0.023	0.090						0.113
ZESA–EdM	0.023	0.062			0.002			0.086
ZESA–SNEL							0.084	0.084
BPC–ZESCO						0.086		0.086
BPC–SNEL						0.086	0.084	0.170
BPC–NamPower		0.119						0.119
BPC–SEC		0.045						0.045
BPC–LEC		0.090						0.090
BPC–HCB						0.101		0.101
BPC–HCB via HVDC		0.136						0.136
BPC–EdM		0.062			0.002			0.064
Eskom–ZESA	0.002							0.002
Eskom–ZESA via HVDC				0.147				0.147
Eskom–ZESCO	0.023					0.086		0.109
Eskom–SNEL	0.023					0.086	0.084	0.193
Eskom–HCB	0.023					0.101		0.123
Eskom–SEC			0.005					0.005
Eskom–EdM					0.002			0.002
NamPower–SNEL	0.023	0.119				0.086	0.084	0.311
NamPower–ZESCO	0.023	0.119				0.086		0.228
NamPower–ZESA	0.002	0.119						0.121
NamPower–BPC		0.119						0.119
NamPower–SEC		0.093						0.093
NamPower–LEC		0.093						0.093
NamPower–HCB via HVDC		0.194						0.194
NamPower–HCB	0.023	0.119				0.101		0.242
NamPower–EdM		0.112			0.002			0.114
HCB–SNEL						0.063	0.084	0.146
HCB–ZESCO						0.063		0.063
HCB–BPC						0.101		0.101
HCB–BPC via HVDC		0.136						0.136
HCB–SEC	0.023	0.045				0.101		0.168
HCB–SEC via HVDC		0.122						0.122
HCB–LEC	0.023	0.090				0.101		0.214
HCB–LEC via HVDC		0.164						0.164
HCB–EdM	0.023	0.062			0.002	0.101		0.187
HCB–EdM via HVDC		0.154						0.154
HCB–Eskom	0.002					0.101		0.102
HCB–NamPower	0.023	0.119				0.101		0.242
HCB–NamPower via HVDC		0.194						0.194

EdM–SNEL	0.023	0.062			0.002	0.086	0.084	0.257
EdM–ZESCO	0.023	0.062			0.002	0.086		0.173
EdM–ZESA	0.002	0.062			0.002			0.066
EdM–BPC		0.062			0.002			0.064
EdM–LEC		0.096			0.002			0.098
EdM–HCB	0.023	0.062			0.002	0.101		0.187
EdM–NamPower		0.112			0.002			0.114
EdM–Eskom					0.002			0.002
EdM–SEC		0.037						0.037
SEC–SNEL	0.023	0.045				0.086	0.084	0.238
SEC–ZESCO	0.023	0.045				0.086		0.154
SEC–ZESA	0.002	0.045						0.047
SEC–BPC		0.045						0.045
SEC–NamPower		0.093						0.093
SEC–LEC		0.066						0.066
SEC–HCB via HVDC		0.122						0.122
SEC–HCB	0.023	0.045				0.101		0.168
SEC–Eskom			0.005					0.005
SEC–EdM		0.037						0.037
LEC–SNEL	0.023	0.090				0.086	0.084	0.283
LEC–ZESCO	0.023	0.090				0.086		0.200
LEC–ZESA	0.002	0.090						0.092
LEC–BPC		0.090						0.090
LEC–NamPower		0.093						0.093
LEC–HCB	0.023	0.090				0.101		0.214
LEC–HCB via HVDC		0.164						0.164
LEC–EdM		0.096			0.002			0.098
LEC–SEC		0.066						0.066

a = high-voltage direct current (HVDC).

ANNEX 2: ELECTRICITY TERMS

Units of power

Power is generated per unit of time and is expressed in watts (W).

1 kW (kilowatt) = 1 000 W
1 MW (megawatt) = 1 000 kW
1 GW (gigawatt) = 1 000 000 kW or 1 000 MW
1 TW (terawatt) = 1 000 000 MW

Units of energy

Energy is power multiplied by time.

1 kWh (kilowatt hour) = 1 kW expended over one hour
1 MWh (megawatt hour) = 1 000 kWh
1 GWh (gigawatt hour) = 1 000 000 kWh or 1 000 MWh
1 TWh (terawatt hour) = 1 000 000 MWh

Voltage

1 kV (kilovolt) = 1 000 volts (V)

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SAIIA'S FUNDING PROFILE

SAIIA raises funds from governments, charitable foundations, companies and individual donors. Our work is currently being co-funded by AusAid, the Bradlow Foundation, the Department of International Development (DFID), the Deutsche Gesellschaft für Technische Zusammenarbeit (GTZ), the European Commission, the Finnish Ministry for Foreign Affairs, the Ford-Foundation, the Friederich Ebert Stiftung (FES), the Graduate Institute of International Studies (GIIS), the International Development Research Centre (IDRC), the International Institute for Sustainable Development (IISD), INWENT, the Konrad Adenauer Foundation, the Organisation for Economic Co-operation and Development (OECD), the Royal Norwegian Ministry of Foreign Affairs, the Royal Danish Ministry of Foreign Affairs, the Royal Netherlands Ministry of Foreign Affairs, the South Centre, the Swedish International Development Agency (SIDA), the Sustainable Development Policy Institute (SDPI), the United Nations Conference on Trade and Development (UNCTAD), the United Nations International Research & Training Institute for the Advancement of Women (INSTRAW), the South African Department of International Relations and Cooperation (DIRCO), Trade and Industrial Policy Strategies (TIPS), the Department of Environmental Affairs (DEAT) of South Africa and the South African Revenue Service (SARS).

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