

# SOUTHERN AFRICA TRADE HUB



## **Technical Report: Role of Regulators in Promoting Clean Energy**

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## LIST OF ACRONYMS

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CE	Clean Energy
CO <sub>2</sub>	Carbon Dioxide
DRC	Democratic Republic of Congo
ECA	Economic Commission for Africa
EWURA	Energy and Water Utilities Regulatory Authority (Tanzania)
FINESSE	Financing Energy Services for Small-Scale Energy Users
GDP	Gross Domestic Product
GEF	Global Environmental Facility
GHG	Greenhouse Gas
GWh	Gig watt-hour
GW	Gig watt
IPP	Independent Power Producer
ISO	International Organization for Standards
ISES	International Solar Energy Society
IUCN	International Union for the Conservation of Nature
KW	Kilowatt
KWh	Kilowatt-hour
MDG	Millennium Development Goal
MW	Megawatt
MWh	Megawatt-hour
NERSA	National Energy Regulator of South Africa
ORERA	Office of the Renewable Energy Regulator (Australia)
PPA	Power Purchase Agreement
PV	Photovoltaic
REEEP	Renewable Energy and Energy Efficiency Partnership
RESAP	Renewable Energy Strategy and Action Plan
RERA	Regional Electricity Regulators Association
RET	Renewable Energy Technology
RISDP	Regional Indicative Strategic Development Plan
SADC	Southern African Development Community
SAPP	Southern African Power Pool
TANESCO	Tanzania Electric Supply Company Limited
TOE	Ton of Oil Equivalent

UNFCCC	United Nations Framework Convention on Climate Change
UNCED	United Nations Conference on Environment and Development
UNDP	United Nations Development Program
UNECA	United Nations Economic Commission for Africa
UNISE	UNDP Initiative for Sustainable Energy
WSSD	World Summit on Sustainable Development

## 1. INTRODUCTION

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Adequate, reliable and affordable supply of energy and its utilization in an environmentally safe and healthy manner are critical objectives in the social and economic development of the Southern African Development Community (SADC). Renewable energy, in particular, is already abundant in the region and is a highly strategic energy supply option.

This manual addresses the market potential and development strategies for renewable energy technologies (RETs) in the SADC region. It is primarily aimed at commissioners and board members of the regional energy regulatory agencies. Such agencies across the SADC region constitute an important component of their national policy and institutional frameworks for promoting sustainable and environmentally safe energy supply. Energy regulators play a key role in national and regional efforts to promote clean energy for sustainable development. Their work is crucial for ensuring a transparent and predictable energy regulatory framework that is essential for attracting private sector investment while safeguarding consumer interests.

This manual is offered as a roadmap guiding energy regulators on best practices for promoting clean energy and climate change initiatives in the context of their role as board members of national energy institutions. Commissioners and board members have a vital positive role in fostering clean energy use. They assist governments to achieve their national and regional energy policy objectives and to expand the contribution of clean energy to the SADC energy mix. They also provide crucial policy leadership to management and technical staff of regulatory agencies.

The regulators need to quickly grasp the essence of clean energy and climate change issues in order to efficiently assume and implement their duties. Given the rapid evolution of the clean energy field and the ongoing climate change debate, they face the challenge of responding quickly and adequately to the expectations of all stakeholders including government policy makers, energy service providers and consumers as well as those engaged with sustainable development issues.

This manual is intended to aid commissioners and board members in gaining a better understanding of their roles and responsibilities. It is hoped that the manual is timely, as many of the regional regulatory agencies are in the initial stages of establishing renewable energy units within their organizational structures. Finally, although these guidelines are primarily aimed at energy commissioners and board members, they are also of interest to other audiences affected by the actions or inaction of national energy institutions.

The manual provides an overview of the clean energy and climate change issues summarizes relevant regional clean energy policies and technologies, discusses challenges faced by regulators and global best practices that have successfully promoted clean energy and climate change initiatives.

### Rationale

Why promote clean energy and climate change initiatives? There are a multitude of reasons and this manual emphasizes three main perspectives.

- **First**, the SADC region currently faces a power deficit that threatens continued economic growth despite the abundance of clean energy sources that would help enhance security of supply if developed.

- **Second**, exploitation of clean energy potential can contribute to the improvement of social and health conditions through increased access to electricity, job creation and transfer of technical expertise.
- **Third**, wide-scale deployment of clean energy technologies can contribute to the national, regional and global environmental effort of reducing harmful fossil fuel emissions and ameliorating related global warming and climate change consequences.

This manual was developed in the context of SADC energy policy objectives expressed in the SADC Energy Protocol, the Regional Indicative Strategic Development Plan (RISDP) and the Energy Ministers' policy statements.

Examples of best practice guidelines are derived from various countries in the region and from around the world. These examples illustrate how particular good governance principles yielded desired results, such as growth in energy investment, while protecting the interests of the consumers.

## Structure

The structure of this manual is as follows:

- **Section 1** briefly overviews clean energy and climate change issues in the SADC region and highlights their importance to regulators.
- **Section 2** provides an overview of SADC energy policy, legal and institutional framework relevant to the energy sector, and climate change topics with which energy regulators need to be acquainted.
- **Section 3** details sources of renewable energy particularly relevant to SADC and discusses their market potential.
- **Section 4** reviews traditional energy regulation functions and summarizes specific challenges faced by regulators with regard to renewable energy.
- **Section 5** presents selected best practices from the region and the world regarding the role of energy regulators in promoting clean energy and climate change initiatives.
- **Section 6** highlights the next steps energy regulators need to take to encourage renewable energy promotion and climate change initiatives in the region.

## 2. CLEAN ENERGY AND CLIMATE CHANGE ISSUES

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### 2.1. Energy Use in SADC

Environmentally-friendly energy sources that limit environmental pollution are variously described as “clean energy,” “green energy,” “renewable energy” and “alternative energy.” These terms are considered synonymous as they all generally refer to energy sources such as solar, wind, small and mini hydropower, bioenergy, geothermal energy, wave and tidal energy. Technically clean energy also includes nuclear energy. In this manual, the

terms “clean energy” and “renewable energy” are used interchangeably<sup>1</sup> in the context that nuclear energy is not considered in this manual.

Clean energy sources have attracted great interest because of their potential to generate electricity and heat using technologies considered environmentally non-polluting compared to fossil fuels such as coal and petroleum. Electricity is generated through a variety of sources in Southern Africa. As of 2010, the generation mix in the region was dominated by coal (70%), hydro (15%) and gas (6%).<sup>2</sup> World figures for electricity generation by source in 2007 show coal’s contribution of 41.6 percent, Gas 20.9 percent, Hydro 15.6 percent, Nuclear 13.8 percent, Oil 5.6 percent and other 2.6 percent<sup>3</sup>. Promoting clean energy and supporting climate change initiatives are relatively new additions to the functions of energy regulators in the region. The limited use of renewable energy sources has meant that a vital resource has not been strategically used to help resolve the energy crisis in the region.

In SADC, clean energy (other than hydro) has played a relatively minor role in energy supplies, contributing less than 0.5 percent to the regional generation mix.<sup>4</sup> Its importance has, however, been of interest in recent years when the region’s demand for energy has outpaced generating capacity resulting in an energy crisis as is evident by frequent load-shedding and power outages<sup>5</sup>. In 2006, Namibia recorded 18 days of outages and Botswana 21 days.

The energy sector in the SADC region has the following characteristics:

- Access to commercial energy such as electricity remains limited. Only about 30 percent of the SADC population has access to electricity, compared to the world average of 75 percent.<sup>6</sup> In the rural areas, where the majority of the regional population lives, the access rate is much lower, estimated to be at 2 percent.<sup>7</sup>
- The region’s per capita energy consumption is also only 0.6 MWh compared to the world average of 2.6 MWh.<sup>8</sup>
- By far the largest proportion of electricity (about 70 percent) is primarily derived from thermal (coal fired) power stations.
- Energy consumption in the region is heavily dominated by biomass. As many as 70 to 80 percent of Southern Africa’s estimates 270 million people depend on traditional

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<sup>1</sup> Please refer to the glossary provided in Annex 1 for definitions of these and other terms.

<sup>2</sup> Regional Electricity Regulators Association, “Electricity Tariffs and Selected Performance Indicators for the SADC Region: 2010” (draft).

<sup>3</sup> OECD Factbook 2010.

<sup>4</sup> RERA, 2010 (draft).

<sup>5</sup> Average number of days per year that establishments experience power outages.

<sup>6</sup> This estimate was presented at the 32<sup>nd</sup> Conference of SADC Energy Ministers. Access to electricity in the region averages 30 percent, ranging from below 10 percent (DRC and Malawi) to over 80 percent (South Africa and Mauritius). See “SADC Ministers Collaborate for Greater Energy Efficiency,” Botswana Gazette, 1 June 2011.

<sup>7</sup> Economic Commission for Africa, “Sustainable Energy: Framework for New and Renewable Energy in Southern Africa,” 2006.

<sup>8</sup> SADC, “SADC Infrastructure - Development Status Report for Council and Summit,” SADC, Gaborone, September 2009.

sources, particularly fuel wood, for cooking, heating and lighting.<sup>9</sup> This dependency not only hampers economic development but also carries health consequences described below.

- The modern sectors of the majority of SADC economies and urban areas are heavily dependent on imported oil as a commercial fuel.
- The region has been facing a persistent power deficit. In 2010 SADC electricity networks carried 49,981MW of installed capacity. Meanwhile, the peak demand was 45,650MW which required generation capacity amounting to 50,306MW.<sup>10</sup> This leads to an estimated deficit of 325MW.<sup>11</sup>
- The legal and regulatory framework specifically addressing renewable energy in most SADC countries continues to be very limited. South Africa is one country where a supportive regulatory environment has been developed offering the requisite support mechanisms for development and wide-scale deployment of renewable energy technologies.<sup>12</sup>

## 2.2. Climate Change Issues

Climate change is a global phenomenon attributed to the accumulation of greenhouse gases (GHG) in the Earth's lower atmosphere. The GHG include carbon dioxide, methane, nitrous oxide, and sulfur hexafluoride. Although GHG make up only one percent of the Earth's atmosphere, they regulate the world's climate by trapping heat in a warm-air "blanket" that surrounds the Earth giving rise to the phenomenon called the "greenhouse effect." The global concentration of these gases is increasing, mainly due to human activities, which include:

- The combustion of fossil fuels releasing carbon dioxide. At a global level the electricity sector is responsible for 23 percent of GHG emissions. The atmospheric concentration of carbon dioxide, the main GHG, has increased by 30 percent since preindustrial times.
- Deforestation: forests remove carbon from the atmosphere.

Farming practices and land use changes such as soil cultivation contribute to the increase in the levels of methane and nitrous oxide. Agriculture is attributed to the have significant effects on climate change, primarily through the production and release of GHGs such as carbon dioxide, methane and nitro oxide and also by changing the Earth's land cover.

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<sup>9</sup> RERA, 2010 (draft).

<sup>10</sup> This number takes into account the need to meet the 10.2% minimum reserve capacity requirements.

<sup>11</sup> These estimates were quoted at the May 2011 meeting of the SADC Energy Ministers. See SADC, "Press Release: 32<sup>nd</sup> SADC Energy Ministers Meeting, Gaborone, Botswana," 26 May 2011.

<sup>12</sup> In generalizing the energy regulatory frameworks of SADC member states, South Africa represents an exception due to its advanced industrial economy backed by a sophisticated legal and regulatory regime. The South African regulatory environment provides conditions conducive for successfully adopting regulatory/support mechanisms that are deployed in developed economies.

Small increases in temperature have the potential to affect cloud cover, precipitation, wind patterns, the frequency and severity of storms as well as duration of seasons. These climatic changes have a direct impact on overall development in the SADC region by affecting food production and electricity generation. An Eskom study on the impact of climate change on hydro-electric generation in the Zambezi river basin, for example, established that climate change/variability has affected hydro-power generation.<sup>13</sup>

The International Energy Agency predicts that emissions of carbon dioxide (CO<sub>2</sub>), the most significant GHG, will increase by about 40 percent by 2030. Southern Africa is the region with the highest CO<sub>2</sub> emissions in Sub-Saharan Africa with more than 90 percent of the emissions accounted for by South Africa with the vast majority of these emissions come from coal based power generation alone. Consequently Southern Africa has substantial energy-sector mitigation opportunities in Africa for developing clean energy projects and low carbon energy alternatives that can access an increasing array of funds such as Carbon Finance and Climate Investment Funds.

### ***Modern Commercial Energy***

Current fossil fuel production and consumption patterns in the region are recognized as adversely impacting the quality of the environment through CO<sub>2</sub> and GHG emissions.

### ***Traditional Energy***

Traditional energy production and use is dominated by biomass energy. Apart from the adverse social effects arising from the opportunity costs of time spent in searching and gathering firewood for cooking and heating, especially felt by women, other serious effects include health problems such as eye ailments and acute respiratory infections due to indoor air pollution from burning fuel wood, crop residues or animal dung.

## **2.3. Role of Regulators**

As regional governments' energy policies are reformulated to underscore the priority accorded to the development of renewable energy sources, regulators must take on new responsibilities of helping the wider deployment of clean energy and lend support to climate change initiatives.

Within their national mandate to oversee efficiency in energy sector operations, regulators are expected to help realize the vast renewable energy potential of the SADC region. This task also entails ensuring that the regulatory framework does not hinder the deployment of clean energy technologies or the attraction of local and foreign investment. The responsibility of the regulators thus includes helping to create an enabling environment that ensures certainty and transparency in administering energy regulatory rules and regulations.

In performing their functions, it is therefore crucial that regulators are familiar with international best practices related to the development and implementation of renewable energy technologies (RETs). Using international best practices for guidance can assist the

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<sup>13</sup> Prof. F. D. Yamba et al (2010) 'Impact of Climate Change on Hydro-Electric Generation in the Zambezi River Basin, Eskom.

development of appropriate regulatory framework for positively influencing investment decisions of entrepreneurs and thus accelerate RET deployment.

In most SADC countries, environmental regulation is often the mandate of a separate oversight agency under a ministry different from one overseeing energy affairs. Similarly, the responsibility over fiscal and investment incentives often lies outside the direct responsibilities of energy regulators. This means that energy regulators must, as a necessity, coordinate their policies with institutions that have a critical bearing on the promotion of clean energy and climate change initiatives.

### **3. POLICY, LEGAL AND INSTITUTIONAL FRAMEWORKS**

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Development of policy, legal and institutional frameworks that are clear and unambiguous is essential for effective promotion of clean energy initiatives. Well-articulated policies indicate the direction and steps for regulators to take in implementing the desired strategy and guide the actions of industry players. A sound legal framework creates certainty, ensures predictability of regulators' actions and improves confidence that decisions are made on a level playing field. In this context a key role of energy regulators is to advise governments on the efficiency and effectiveness of the existing frameworks.

Regulators need to develop capacity to analyze the existing renewable energy policy and make appropriate recommendations for any necessary changes that will enhance the government's ability to achieve the objectives articulated at the national and SADC levels. To this end, it is imperative that regulators are familiar with legal and institutional frameworks at both levels.

At the national level, most SADC member states have formulated renewable energy policies and strategies to guide the work of implementing institutions, including regulatory agencies. As clean energy and climate change initiatives gain importance, there is a new imperative to revise existing policies, expand their visibility and improve clarity regarding the responsibilities of key players.

At the SADC level, the importance of renewable energy and its market potential have been emphasized in various documents and decision-making fora. The May 2011 meeting of the SADC Energy Ministers called for the development of sustainable energy solutions to the regional power crisis. Ministers underscored their commitment to realizing the renewable energy potential and addressing climate change issues related to energy development and utilization.<sup>14</sup>

#### **3.1. SADC Energy Sector: Guiding Instruments**

Three reference documents form the basis upon which the regional energy strategy is founded: the SADC Energy Protocol (1996), the SADC Energy Cooperation Policy and Strategy (1996), and the SADC Energy Activity Plan (2000). These documents and the policy statements of Energy Ministers of SADC member states provide the broad framework for the development of clean energy in the region.

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<sup>14</sup> SADC, "Press Release: 32<sup>nd</sup> SADC Energy Ministers Meeting, Gaborone, Botswana," 26 May 2011.

### ***SADC Energy Protocol***

The SADC Energy Protocol, signed in 1996, provides the legal and policy framework for energy cooperation, based on the following objectives:

- Harmonize national and regional energy policies
- Enhance cooperation in energy development, energy pooling, energy research development adaptation, dissemination of low cost energy technologies
- Ensure provision of reliable cost-effective energy
- Promote joint institutional and human resource capacity development

The Protocol has been operationalized through the Energy Strategy and Action Plan and the Energy Activity Plan.

### ***SADC Energy Policy Objective***

SADC's overall energy sector objective is "to ensure the availability of sufficient, affordable and acceptable energy services that are to act as a catalyst for economic development and eradication of poverty, without losing sight of the need for an environmentally sustainable use of energy resources."<sup>15</sup> The emphasis on least-cost energy services is also meant to help meet SADC's broad objective of attracting investment and promoting competitiveness and trade as means of achieving economic growth and poverty reduction. The development of renewable energy has been accorded great importance in achieving this objective as alluded to in the sections above.

### ***The Regional Indicative Strategic Development Plan***

The fifteen-year Southern African Regional Indicative Strategic Development Plan (RISDP) was adopted in 2004. The RISDP emphasizes good political, economic and corporate governance as prerequisites for sustainable socio-economic development without which poverty eradication and regional integration would not be realized. The objectives of the RISDP are to (1) provide strategic direction with respect to SADC programs and activities, and (2) provide a comprehensive view of the SADC economic and social development policies and priorities.<sup>16</sup>

The RISDP outlines some energy targets, including a number of regional objectives in energy sector development. In particular, the plan specifies a target for increasing access to modern energy services to 70 percent of the SADC population by 2018. For the renewable energy sector, this target holds promise for development and access to services by a majority of SADC citizens. However, apart from the modern energy target for rural areas under RISDP, the regional renewable energy framework does not provide member States any specific targets to aim for at a national level.<sup>17</sup>

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<sup>15</sup> SADC, Press Release, 26 May 2011.

<sup>16</sup> SADC, "Southern Africa Development Community Regional Indicative Strategic Development Plan," 2004.

<sup>17</sup> ECA, "Sustainable Energy: Framework for New and Renewable Energy in Southern Africa," 2006.

## ***SADC Policies Specifically Addressing Renewable Energy***

Policies and strategies related to the renewable energy sector aim at the following:<sup>18</sup>

- Develop appropriate financing mechanisms and fiscal regimes suitable for the development of RETs.
- Strengthen the regional capacity for RET project development, management, monitoring and evaluation via training and pooling of regional human resources.
- Facilitate the link between stakeholders with a view to promoting commercialization and greater use of RETs.
- Promote cost-effective pilot activities and projects for diffusion of RETs.
- Collaborate with stakeholders in identifying specific needs of different energy users in order to develop programs that tally with these needs.
- Increase public awareness of RETs by lobbying governments, donors, commercial entities and industries for their financial and political support of a RETs agenda.
- Facilitate contact and cooperation among institutions involved in research and development of RETs technologies with a view to establishing consistent product standard.

## ***SADC Renewable Energy Programs***

SADC is in the process of preparing for the SADC Renewable Energy Strategy and Action Plan (RESAP) which is expected to contribute to the overall goal of SADC member states to utilize and benefit from the vast renewable energy resources. The RESAP will be completed in the first quarter of 2012. The focus, in addition to bioenergy, is on solar energy and hydro power development and putting into use least-cost energy production options. These steps are anticipated to increase the availability of energy to a great majority of people, to help expand economic activities and productivity and alleviate poverty.

## ***Southern Africa Power Pool***

The Southern African Power Pool (SAPP) was established in 1995.<sup>19</sup> Its purpose, according to the SAPP agreements, is to allow its members to coordinate the planning and operation of their systems while maintaining reliability, autonomy and self-sufficiency, and to share in the benefits of operating the pool. The energy ministers are responsible for resolving major policy issues in the SAPP and for admitting new members to the pool.

SAPP is giving priority attention to promoting clean energy and climate change initiatives in its programs such as the assessment of the impact of renewable energy technologies on the grid and operations of the Southern African Power Pool.

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<sup>18</sup> Economic Commission for New and Renewable Energy in Southern Africa.

<sup>19</sup> SAPP was established by the Inter-Governmental Memorandum of Understanding and its subsidiary agreements: the Inter-Utility Memorandum of Understanding, the Agreement Between Operating Members, and the Operating Guidelines signed by all the SADC members and their national power utilities.

## ***Renewable Energy Regulation in the SADC Region***

SADC Energy Ministers established the Regional Electricity Regulators Association (RERA) in 2002 with the mandate to engage in regional cooperation in electricity regulation. The association's responsibilities include the following:

- Building regulatory understanding, capacity and skills among regulators and other entities with regulatory responsibilities.
- Promoting the creation and establishment of independent regulators in countries where they currently do not exist.
- Assisting the harmonization of legal and regulatory systems and practices governing electricity markets in the region.
- Undertaking economic regulation of electricity interconnection and trade between SADC member states.

By August 2011, eleven of the fifteen SADC member states had introduced energy or electricity regulatory agencies. These countries and corresponding institutions are the following:

- Namibia: Electricity Control Board
- Tanzania: Energy and Water Utilities Regulatory Authority
- Zambia: Energy Regulation Board
- Angola: Institute for Electricity Regulation
- Lesotho: Electricity Authority
- Malawi: Energy Regulatory Authority
- Mozambique: National Electricity Advisory Council
- South Africa: National Energy Regulator
- Swaziland: Energy Regulatory Authority
- Madagascar: Office of Electricity Regulation
- Zimbabwe: Electricity Regulatory Commission

The South African energy regulator has one of the most developed renewable energy regulatory frameworks in the region while others are just beginning to build capacity in renewable energy regulation. Countries that have not yet formed energy or electricity regulatory agencies but are in the process include: Botswana, Democratic Republic of the Congo, Mauritius and Seychelles.

## ***Environmental Issues***

SADC has endeavored to actively participate and ratify international environmental agreements to ensure environmental sustainability. These agreements include the following:

- UN Framework Convention on Climate Change (UNFCCC). This is a non-binding treaty whose objective is to stabilize GHG concentrations in the atmosphere.
- UN Convention to Combat Desertification (UNCCD) established to combat desertification and mitigate the effects of drought.
- UN Convention on Biological Diversity (UNCBC) whose objectives include conservation of biological diversity and sustainable use of the components of biological diversity.
- Ramsar Convention which is a treaty for the conservation and sustainable utilization of wetlands.
- Millennium Development Goals agreed by all United Nations Organization member states and international organizations. Goals include eradication of extreme poverty and hunger and ensuring environmental sustainability.

In addition SADC developed a Common Strategy on Climate Change for the Seventeenth Conference of Parties (COP17) on climate change in 2011 approved by the Ministers responsible for Environment and Natural Resources. The main feature of the strategy are (i) Adaptation - aimed at provision of funds to support projects that among other things would enhance energy production; (ii) Mitigation – aimed at mobilizing financial and technical support for the preparation of Nationally Appropriate Mitigation Actions and establishment of institutional structures for local and regional capacity for planning; (iii) Capacity Building – aimed at guaranteeing financial support for capacity building, knowledge sharing within the region; (iv) Finance – aimed at improving climate change financial mechanisms; (v) Technology Transfer – aimed at transfer of technologies that will promote and enhance adaptation to and mitigation of climate change; (vi) Reduced Emissions from Deforestation and forest Degradation ; and (vii) the Nairobi Work Program aimed at strengthening research and resource institutions<sup>20</sup>.

### ***Role of Regulators***

Many of the national renewable energy policies and strategies within SADC have been overtaken by regional and global developments in the sector, signaling an urgent need for these documents to be updated. Regulators need to take this opportunity to provide regulatory policy advice to national governments and SADC.

In addition, regional regulators have the responsibility of helping to shape a harmonized SADC-wide legal and policy framework for clean energy. Apart from the crucial role of advancing the goal of regional integration which has the potential to provide a larger market for RE, and opportunities for trade a harmonized policy would help create and ensure access to the transmission grid, narrow the regulatory policies, and harmonize standards and codes of practice.

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<sup>20</sup> SADC Common Strategy on Climate Change for COP17.

## 4. RELEVANT RENEWABLE ENERGY SOURCES AND SADC MARKET POTENTIAL

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Several sources of clean energy are of present and practical relevance to the SADC region. These sources include solar energy, bioenergy, wind energy, and small and mini hydro.<sup>21</sup>

### 4.1. Solar

The geographic location of the SADC region offers enormous potential for solar power. Solar energy is directly harnessed from the sun's radiation as it reaches the earth. Two main methods of harnessing solar energy include (1) thermal energy: converting the sunlight to heat, mechanical energy and ultimately electricity, and (2) using solar panels, known as photovoltaic (PV) cells, which directly convert sunlight to electricity.<sup>22</sup>

The following factors are at the core of the great potential of the regional solar energy market:

- Solar energy is a free and virtually unlimited resource in all countries of the region. SADC region offers high levels of sunlight, with the regional average of 4 kWh per meter per day, which is sufficient for most designs of photovoltaic cells and thermal solar conversion or collection devices.
- Solar energy technology has been tested and proven to be economically competitive with some conventional technologies, especially in rural areas which are far from the national grid.
- Solar energy has the economic potential to contribute to security of supply, raising the quality of life among the rural and urban poor through expanding access to electricity and critical services.
- Expanding the use of solar energy forms a key component of programs aimed at slowing deforestation and desertification which are driven by rapid population increase dependent on forests to meet their fuel wood supplies.
- Solar energy is virtually non-polluting and reduces CO<sub>2</sub> emissions resulting from the production and use of fossil fuels, such as coal and petroleum products.

The solar energy market, however, also faces some challenges, which include the intermittency of its availability for part of the day and on cloudy days. This characteristic necessitates that investment in solar power is accompanied with investment in power storage systems.

The current use of solar energy in the region includes solar water heating, water pumping, communications, refrigeration and lighting. In addition many countries of the region are implementing rural electrification programs based on photovoltaic cells to raise rural standards of living and stimulate rural growth. The use of PV cells in telecommunications,

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<sup>21</sup> Refer to the glossary presented in Annex 1 for definitions of each of these clean energy sources. Other renewable energy sources with less direct relevance to the SADC region include geothermal sources and tidal wave energy.

<sup>22</sup> Photovoltaic (PV) cells are devices (panels) that use silicon cells to convert solar energy directly into electricity.

vaccine preservation in remote clinics and provision of lighting in primary schools is widespread.<sup>23</sup>

It is currently recognized that further deployment of solar energy also requires an adequate and fully functioning regulatory framework that can attract private sector participation. Such a regulatory framework to deliver desired goals should include the following:

- Appropriately fit intermittent electricity supply into the national and regional portfolio of energy resources.
- Provide for a mechanism for assessing the impact of electricity injections from PV on the national grid stability.
- Provide for the establishment of adequate standards of solar energy technology.
- Ensure adequate regulatory capacity for understanding solar technology innovations, and undertake solar project technical and financial analysis.
- Facilitate public, private and public private partnership initiatives in the solar industry.
- Exercise appropriate electricity tariff regulation to facilitate the flow of investment in the solar industry.
- Create and enforce a level playing field in the sector for all participants in the solar industry.

#### **4.2. Wind**

Some of the best wind sites in the SADC region include the coastal areas of Namibia, western areas of South Africa, Mozambique, Lesotho and Mauritius where this source of energy presents an inexhaustible renewable source of energy for electricity generation or direct heat to drive pumps. These areas present market potential for small wind turbines, which alone or as part of a hybrid system, have the potential to power homes, businesses and farms. Wind energy is perfect for remote applications, such as water pumping for clean water supply and agricultural production.

The potential market for wind energy can also be significant where it is articulated as part of a rural development strategy. Suitable small wind energy systems can be connected to the electricity distribution system. There is also potential for such systems to reduce consumption of utility-supplied electricity for lighting, appliances and electric heat.

As part of the power sector reforms being implemented by several SADC countries national energy policies are being revised to include methods of integrating renewable energy sources such as wind into the mainstream electricity market. Wind farms are being established in Lesotho, South Africa, Mauritius and other countries with necessary wind regimes to generate electricity generated from renewable for sell to the electricity markets and national utility companies through targeted schemes and incentives, such as feed-in tariff schemes which aim at encouraging investment in RETs.

Wind power can also be used in stand-alone systems which are not connected to an electric distribution system or grid. In these off-grid systems, small wind-powered electric

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<sup>23</sup> ECA, "Sustainable Energy: Framework for New and Renewable Energy in Southern Africa," 2006.

systems can be used in combination with other systems – including small solar electric systems – to form hybrid power networks. These hybrid power systems can provide reliable off-grid power for homes and other economic activities.

At sites with good potential for harnessing wind energy, new wind power generation technologies are proving competitive as the cost of wind energy continues to fall with maturing technology. Electricity generation from wind is generally regarded as having a light carbon footprint since its production does not produce harmful emissions, any hazardous waste and does not deplete natural resources. It is also a proven and efficient technology that can be deployed quickly.

### **4.3. Small and Mini Hydropower**

While there is no generally agreed definition of “small” as it applies to hydropower projects, the term often also includes “mini” and “micro” hydro, and refers to hydroelectric units with capacities ranging from 5-50 kW to less than 10 MW. Small, micro and mini hydro involve the harnessing of power from water at a small scale.

Currently most of the unexploited small and mini hydro sites are located in remote areas of Southern Africa where there are perennial streams, rivers and tributaries with hydropower development potential. An example is the 700 kW Zengamina mini hydro scheme in a remote part of Zambia which provides cheap, clean and sustainable electric power. It has eliminated dependence on diesel generators and supplies the local hospital, farms, village and the chief’s palace with electricity. The project is an example of an inexpensive energy option for lighting (displacing kerosene). It has also created the basis for self-sustaining development of the local economy, and is contributing to rural poverty reduction.

The utilization of the region’s small and mini hydro potential in the region is currently still very low mainly due to the challenge posed by the remoteness of some sites and lack of markets near the generation plant. Where sites can be developed near population centers, small and mini hydro are best suited for remote rural connection than nation grid connection. Rural electrification programs seeking to utilize such sources of energy are being implemented by governments and present a potential market for mini hydro technologies. Further the attraction of small and mini hydro lies in the fact that apart from providing clean energy, they avoid the significant environmental impacts associated with large-scale hydro which includes, among other things, loss of habitat, change in water quality flooding and siltation. The potential for small hydro development in the region is high as the technology is proven to be efficient and reliable where it has been developed.

Small hydro sites also have the potential to contribute to food security and improved living conditions through irrigation and water supply. To promote the deployment of mini hydro technologies, regulators should consider some of the following actions:

- Advise governments on required “smart” subsidies to encourage private sector investment in rural areas where there is potential to make small and hydro viable in the long run. “Smart” subsidies are made to reduce the costs of initial investment in order to encourage implementation of projects in otherwise unprofitable regions.
- Formulate and regulate a grid code which would set the rules and guarantee investor access (independent power developers, producers) in small hydro to the national utility grid where this is feasible.

#### 4.4. Bioenergy

Bioenergy is provided by plant and animal materials. It is obtained from either direct combustion of such organic matter such as animal, vegetable and waste materials or their conversion into methane for subsequent combustion. There are three basic approaches to using biomass fuels: (1) direct combustion; (2) biochemical processing to produce fuel of a higher grade, usually with a fertilizer-type material as a by-product; and, (3) thermochemical processing to produce fuel of a higher grade.

Biofuels in particular are converted from biomass into useable forms of energy. These energy forms include methane, the main ingredient of natural gas, and transportation fuels such as ethanol and biodiesel.

### 5. CHALLENGES AND MECHANISMS FOR RENEWABLE ENERGY REGULATION

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SADC Member States have taken decisive policy actions to establish independent energy regulators aimed at improving security of supply, competitive markets and access to modern energy services. They have also identified clean energy technologies as a crucial contributing factor national and regional energy supplies and improving the quality. This section overviews some of the challenges facing regulators, discusses commonly used regulatory mechanisms, and summarizes selected best practices for promoting the uptake of clean energy initiatives in the region.<sup>24</sup>

#### 5.1. Challenges

In the SADC region, the electricity sector is dominated by vertically integrated state-owned power utilities. This has sometimes posed a challenge to regulators especially where such state owned utilities report to the same responsible ministry as the regulator and are the single buyer of all electricity generated in the country. Power reforms in many SADC countries are now seeking to encourage the establishment of independent power producers (IPPs), including those generating electricity from RE sources.

Independent power developers and producers are looking to energy regulators that are independent and are also transparent, accountable and predictable regulatory functions. This is often cited as a necessary condition for attracting investment and promotion of wider deployment of RETs. However, carrying out their role is often difficult in the absence of a clear policy, legal and independent institutional framework. Some of the key challenges faced by both national and regional energy regulators in SADC include the following:

- Regional and local knowledge of clean energy technologies and climate change issues is often insufficient. Information asymmetry, a condition in which the industry being regulated knows more about the industry than the regulator is prevalent due mainly because in most cases, the subject of clean energy is relatively new to regulators in the region. For many countries in the region renewable energy regulatory frameworks are yet to be developed.

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<sup>24</sup> “Best practices” refer to approaches, processes or procedures which have generally produced results to achieve increased use of RETs around the world, and which regulators in the SADC region could consider in their efforts to promote wider uptake of clean energy.

- There is an information gap regarding access to financial resources and schemes for supporting renewable energy schemes despite the fact that the costs of some technologies, especially wind, have fallen. There is a perception that renewable energy technologies financing is riskier and cannot compete with established conventional generation in most situations.
- In most cases energy regulators are perceived as not being independent from government influence. Board of Regulators in most countries are appointed by government further entrenching the perception of lack of independent regulatory action. In some countries the private sector has cited the perception of unclear licencing processes and political influence as barriers to investment in renewable energy. This challenge is accentuated by the dominance of vertically integrated state-owned national power utilities with more political muscle than the regulator in some of the countries.
- Due to technical reasons renewable energy technologies are characterized by intermittency of power supply – particularly for wind, solar and cogeneration projects in which heat produced is simultaneously used to generate electricity– in comparison to conventional and established systems which are designed for constant, predictable output from large-scale centralized generating plants. This has given renewable technologies the perception of unreliability.
- Most regulators do not possess the necessary capacity for technically and financially evaluating different types of renewable technologies with varying characteristics to make informed regulatory decisions for supporting particular renewable energy technologies. Creating sufficient investor confidence to develop clean energy projects remains a challenge.
- Coordination with other national institutions with mandates bearing on renewable energy promotion can be a complex challenge partly also due to different reporting channels. Energy and environment regulators often hold separate mandates and use different channels of reporting to the government. For example, the energy regulator may be responsible for renewable energy production and price regulation the environmental regulatory agency is nationally responsible for environmental standards and climate change issues, the finance ministry is responsible for fiscal incentives necessary for promoting renewable energy while the ministry of industry would be the final authority on investment issues.
- There are capacity and flexibility challenges with regard to regulatory responses to rapid changes brought about by complexities of the market for renewables and technologies.

## 5.2. Mechanisms for Renewable Energy Promotion

In order to promote RE deployment, energy regulators in the region need to create suitable regulatory policy and support mechanisms. Taking into account local market conditions these mechanisms may include the following tools:

- **Tariff schemes** that vary according to the technical characteristics of renewable energy technologies used to generate electricity. Tariffs will usually vary according to the costs of the technology used.

- **“Standard” power purchase agreements (PPAs)** for producers and purchasers of electricity generated through renewable energy technology. To encourage the development of RE projects, regulators need to establish PPAs that reduce uncertainty and improve predictability for the various actors involved. These PPAs should clarify the roles of the participating players including the national power utility, independent developers and producers; and feed-in-tariffs.
- **Long-term electricity generation licenses to encourage** RET-generated electricity by ensuring the period taken into account enable independent power producers sufficient time to pay off project financing debts.
- **Appropriate tariff setting and adjustment formula** to take into account issues that emerge in the process of implementation. Regulators need to design tariffs and adjustment formula that takes account of “avoided cost” which is the cost a producer escapes by purchasing electricity for resale from another party instead of, for instance constructing a competing thermal power plant.
- **Flexible regulation practices that take into account the varying conditions** that for instance may be disadvantage rural areas as compared to urban areas. In developing countries as found in the SADC region socio-economic conditions may arise which require the regulator to exercise some flexibility, for example, waiving the licensing requirement for small and mini hydro investments below a certain threshold.
- **Explicit targets for the share of renewable energy sources in the electricity generation mix** consistent with targets in national and regional energy policies. The regulator can set explicit targets for the share of electricity generation from proven renewable energy technologies such as hydro, wind, solar PV and biomass-based cogeneration. The baseline target for the European Union is 20 percent by the year 2020. Mauritius has set a target of 35 percent by 2025.
- **Explicit regulations that encourage local private participation** in renewable energy development. In South Africa foreign investors are required to have a local partner to bid for government renewable energy projects as in the case of the tender process launched in September 2011.
- **“Smart” subsidies to RET-based power systems** alluded to above that support, for instance, rural electrification and decentralized systems (In countries where specific rural electrification funds have been established these could partly support smart subsidy schemes) Private sector investment in rural areas can register poor returns and therefore discourage private sector involvement. Regulators can advise governments on appropriate ‘smart subsidies’ for promoting the development of renewable energy systems in rural areas boost the sustainability of such projects.

Around the world, regulators have been implementing some of these support mechanisms in order to promote clean energy and climate change mitigation initiatives. Some of these examples are discussed in the sections below.

### 5.3. Regulating Renewable Energy: Best Practices and Steps

One of the key objectives of regulators in the SADC region is to devise and implement efficient regulatory and support mechanisms that ensure investor confidence. Transparent and predictable regulatory rules and procedures as well as support mechanisms that

reduce uncertainty have the potential to encourage wider deployment of renewable energy technologies as a consequence of a confident private sector. Although socio-economic and political conditions vary according to factors in individual countries there are still lessons that can be learned from the experience of implementing some of the acknowledged principles and best practices for clean energy promotion and climate change initiatives. These include the following:

- Developing institutional capacity to serve as reliable and accessible hubs of information on renewable energy to stakeholders (government, investors and consumers).
- Ensuring wide public consultations as a means of analyzing the effects of regulatory policy on various stakeholders as well as various stakeholders effect on regulatory policies.
- Ensuring consistence of action with regard to all industry players, including government and consumers. This practice would have the effect of creating confidence in the predictability of regulatory action.
- Developing and demonstrating a reputation of autonomy of action especially were it involves state-owned utilities where the perception of political interference is perceived to be strongest.
- Exercise effectiveness and efficiency through timely regulatory decision making.
- Developing and exercising transparency, accountability through clearly defined regulatory processes and rationales for decisions taken with the provision for appropriate review. This has the potential to create the perception of the regulator as objective and fair in its decision making.

### **5.3.1. Policy Advisory Functions**

Regulators by the nature of their work are in a unique position to play the important role of advisors and policy analysts to government because of their experience gained from interacting with consumers and producers of electricity. Regulators should therefore proactively advise government on a regular basis on the changing renewable energy market and required policy and fiscal responses to help achieve the national objectives including promoting investment in clean energy.

### **5.3.2. Feed-in Tariffs**

South Africa is one country in the region where Feed-in-tariffs (FITs) have been developed and tested in the market for renewable energy. Many other SADC countries are at various stages of formulating FITs which are to be adopted as the many tool for encouraging various players in the RE industry including, householders, organizations and businesses to install renewable energy technologies to generate electricity for sell and their own use. Regulators are expected to support this policy by designing or structuring FITs to promote renewable energy in the local environment.

Outside the region Feed-in tariff schemes have been used to guarantee the power producer a minimum tariff for the electricity generated. Under the scheme, the power utilities are obliged to allow such electricity producers access to the grid and agree to buy

all the electricity at the agreed tariff level. The guaranteed period for the operation of FITs has ranged from twenty to twenty-five years.

The implication for Regulators is that they need to develop capacity to design appropriate FITs as well as the capacity to assess and monitor the likely impact of the FIT schemes in their local environment. Although FIT schemes will differ in line with the power sector structures individual countries, Regulators would do well to learn from the experience of countries such as South Africa and others on how the FITs could be designed and implemented.

South Africa introduced feed-in tariffs in 2009, and Botswana and Namibia conducted studies on how to implement FITs. Some examples, such as the initial experience with FITs in Spain, suggest caution and calculated use of FIT to promote wider use of RETs. On the other hand, carefully designed FITs have led to success stories in Germany and California among others. As of 2011, feed-in tariff policies have been enacted in over 50 countries.<sup>25</sup>

### ***Feed-in Tariffs: Experience of Spain***

The initial experience of Spain with FIT has been cited to underscore the importance of designing sustainable tariff schemes. In 2007 Spain, formulated a FIT policy aimed at encouraging investment in solar energy technology for electricity generation. It guaranteed subsidies to companies that met the deadline of September 2008 to enable Spain fulfill its commitments to renewable energy. The guaranteed fixed electricity rates were set at 44 euro cents per kWh for all new solar panel projects connected to the grid by 2008. Instead of only attracting a steady flow of investment there was an overwhelming investment response to the subsidy guaranteed by the FIT which also encouraged numerous small projects to receive up to 575 percent of the average electricity price. In just one year Spain's commitment to solar payments were estimated to have reached \$26.4 billion.

Initially it was expected that the country would not reach 400 MW of solar capacity until 2010 but by late 2007, some 350 MW had already been installed. In response the government raised the target to 1,200 MW. It soon emerged that the solar market would overshoot that limit as well. Developers rushed to connect their projects to the grid before the stated September deadline. Government reacted by revising the FIT rates downwards by 30 percent. The reduction of the tariff precipitated a crash of the solar market.

One important lesson from the Spanish experience is that regulators should develop capacity to correctly gauge the market and design feed-in tariffs that are responsive to market trends. Some of the consequences of the tariff revision in Spain included the stockpiling of excess solar panels, falling prices and loss of more than 20,000 jobs in the solar industry. Some of Spain's problems were partially mitigated by demand from feed-in systems initiated in Italy and France, but even then they all the excess supply solar panels could be absorbed. The solar market crash severely affected many manufacturers of photovoltaic systems. Prior to the crash, the solar market had been rapidly cutting costs, and the Spanish tariff, with its high rates, resulted in an artificial market. Unlike other

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<sup>25</sup> These countries include Algeria, Australia, Austria, Belgium, Brazil, Canada, China, Cyprus, the Czech Republic, Denmark, Estonia, France, Germany, Greece, Hungary, Iran, Republic of Ireland, Israel, Italy, Kenya, the Republic of Korea, Lithuania, Luxembourg, the Netherlands, Portugal, South Africa, Spain, Switzerland, Tanzania, Thailand, Turkey.

countries, such as Germany, Spain FIT design had no built-in mechanism to reduce tariff rates if its capacity targets were exceeded.

### ***Feed-in Tariffs: Experience of South Africa***

In 2009 South Africa became the first African country to introduce feed-in tariffs with the objective of producing 10 terawatt-hours (TWh) of electricity per year by 2013.<sup>26</sup> In a strategy implemented by the National Energy Regulator of South Africa (NERSA), the government announced feed-in tariffs were substantially higher than those in the original NERSA proposal. The tariffs, differentiated by the type of technology, were to be paid for over a period of 20 years. They were based, as in most European countries, on the cost of generation plus a reasonable profit.

The tariffs for wind energy and concentrating solar power were among the most attractive worldwide.

It was observed that the tariff for wind energy in South Africa was higher than that offered in Germany and higher than that proposed in Ontario, Canada.<sup>27</sup> The tariff for concentrating solar was less than that in Spain but was seen as high enough to attract investment.<sup>28</sup> NERSA's revised program followed extensive public consultation.

South Africa hoped that with the FIT rates together with decentralized investment in renewable energy technologies would take off and also contribute to alleviating the energy crisis as well as encourage South African communities to invest in renewable energy to generate electricity, create jobs and new income. It is generally accepted that anticipated increase in investment in renewable energy technologies has been slow, leading to a shift to the mechanism of competitive bidding process launched on August 3, 2011.

### **5.3.3. Quota Mechanisms**

Quota mechanisms are not used yet in the SADC region. They represent a legal obligation for electricity producers to take a proportion of electricity (set by government) they produce, or for customers to source a proportion of their electricity from renewable energy sources for a period of time. At the end of the set period, electricity producers have to demonstrate, through the ownership of credits, their compliance to government targets in order for them to avoid being penalized. Producers receive credit for the electricity they generate from renewable sources in form of "green certificates," "green labels," or "renewable energy credits." The green certificates are tradable and can be sold with power or traded separately. The certificates also serve as proof of meeting the legal obligation.

While FITs establish the price and let the market determine capacity and generation, quotas work in reverse. In the quota system, the government policy sets a target and lets the market determine the price. Typically, governments mandate a minimum share of

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<sup>26</sup> One terawatt-hour is equal to a million megawatts or a billion kilowatts.

<sup>27</sup> The South African tariff for wind energy is 1.25 ZAR per kilowatt-hour (which is equivalent to €0.104, \$0.14 USD or \$0.17 CAD per KWh). This tariff offered in Germany is €0.092 per KWh, and the tariff proposed in Ontario, Canada is \$0.135 CAD per KWh.

<sup>28</sup> The South African tariff for concentrating solar was 2.10 ZAR/kWh (€0.175/kWh), while that in Spain was €0.278/kWh.

capacity or generation of electricity (generally grid-connected only) to come from renewable sources. A fundamental problem with the quota mechanism is that there is no long-term certainty. When a quota is set either for a period of time or for a quantity of power and it is reached, there is no incentive to keep the green power producers from becoming uneconomic in the face of power produced from other sources such as coal fired power stations and hence are prone to collapse as businesses. This drawback with the quota method means that there is reluctance on the part of investors to get involved with the mechanism in the first place. Those that do get involved are often short-term speculators rather than long-term entrepreneurs and, as such, there is inherent instability in this system.

The application of quota systems is relatively new, was first introduced in the late 1990s and there is no experience of the systems in the region to date. Examples of countries where quota systems have been applied include Poland and China. In Poland, all energy companies selling electricity to final consumers and are connected to the grid must comply with the quota system. Quota amounts to be met are expressed as a percentage of the amount of energy sold by the company. The quota amount can be met using any technology or combination of technologies.

#### **5.3.4. Tender Schemes**

Tender schemes are based on competitive bids by interested parties for individual renewable energy projects, following a call for tenders by government. Under tendering systems, government specifies the capacity or share of total electricity to be generated from each renewable energy source over time and the maximum price per kWh. On this basis power developers submit price bids for contracts. In some cases, the government may demand that separate bids are submitted for different technologies to avoid competition among RETs, for example solar PV competing against wind energy projects. Proposals from potential developers are accepted starting with the lowest bid and working upwards, until the level of capacity or generation required is achieved. Winning bids are guaranteed their price for a specified period of time. Under the tender scheme system electricity providers are required to purchase a certain amount of renewable electricity from winning producers at a premium price. The government covers the difference between the market reference price and the winning bid price.

#### ***Tender Schemes: Experience of South Africa***

South Africa is the only country in the SADC region which has developed the tender scheme for promoting investment in renewable energy sources and embarked on the competitive bidding process in August 2011. Under this bidding process, the government plans to procure 3,750MW of renewable energy, comprised of the following:

- 1,850 MW of onshore wind
- 1,450 MW of solar PV
- 200 MW of concentrated solar thermal (CST) energy
- 75 MW of small hydro
- 25 MW of landfill gas
- 12.5 MW of biogas

- 12.5 MW of biomass
- 100 MW of small projects.

The bidding process comprises two steps. The first step involves assessment of the projects on the basis of their structure, legal and financial factors, land acquisition and use, environmental consent, technical and, economic development and bid guarantee. The second step involves the evaluation of bids that pass the first stage on the basis of two criteria: (i) price relative to a ceiling provided in the bid documentation accounts for 70 percent of the decision, and (ii) economic development criteria, which accounts for 30 percent of the decision.

The first round of bids was scheduled for November 4, 2011 with the preferred bidders being announced in late November to early December.<sup>29</sup> Power purchase agreements are then expected to be in place by June 2012. Projects are expected to commence by June 2014, with the exception of the projects utilizing concentrated solar thermal energy, which are expected by June 2015.

## 5.4. Voluntary Mechanisms

### 5.4.1. Green Certificates

Green certificates are used in voluntary markets to support renewable-based generation. The certificates are traded separately from the power and sold to consumers who are willing to pay the additional cost to support clean energy. Green certificates rely on environmentally knowledgeable consumers and their willingness to pay the additional cost. There is no experience of green certificates in the SADC region.

#### ***Green Certificates: Experience of Australia***

In Australia, the Office of the Renewable Energy Regulator (ORER) encourages generation of electricity from ecologically sustainable renewable energy sources and reduction of GHG through two main schemes namely the Large-scale Renewable Energy Target (LRTE) and the Small-scale Renewable Energy Scheme (SRES). These objectives are achieved through: (i) the creation of online certificates by eligible renewable energy sources based on the amount of electricity in megawatt hours (MWh) - **generated** by a renewable energy power station, or small-scale solar panel, wind or hydro system, or **displaced** by a solar water heater or heat pump; and, (ii) by placing a legal obligation on liable entities (usually electricity retailers) to purchase and surrender a certain amount of these certificates each year.

Trade in these certificates provides a financial incentive for investment in renewable energy power stations and for the installation of solar water heaters and heat pumps, as well as small-scale solar panel, wind and hydro systems. The certificates are created and traded through an online registry managed by ORERA. It has been reported that since 2001, this mechanism has increased the number of installations of small-scale renewable

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<sup>29</sup> The announcement of preferred bidders is expected to take place during the 17<sup>th</sup> Conference of the Parties (COP) of the UN Framework Convention on Climate Change scheduled for November 28 – December 9 in Durban, South Africa.

energy systems, and stimulated investment in renewable energy power stations. In late 2010, total investment in large-scale renewable energy power stations stood at around \$9 billion. The generating capability of renewable power stations was around 12,200 GWh of eligible renewable energy. From 2001 to 2009, 86,000 solar panel systems were installed with a combined capacity of 123 MW. In 2010 there were over 158,000 solar panel installations with a combined capacity of 305 MW.

#### **5.4.2. Green Power**

“Green power” is a scheme currently implemented in well-developed power markets of developed countries where consumers buy “green” power from suppliers of their choice. These schemes operate in power markets that are highly competitive and assume that consumers are knowledgeable about environmental issues on which they base their choice of power supplier. The structures and conditions for retail competitive power markets do not yet exist in the SADC region.

#### **5.4.3. Various Hybrid Schemes Involving Two of the Above Mechanisms**

Hybrid mechanisms consist of a mixture of support mechanisms to drive renewable energy development. Hybrid schemes have the advantage of enabling the strengths of individual mechanisms to be adopted to compensate for the weaknesses of other measures. The flexibility of hybrid schemes also allows investors to choose schemes that are in line with their strengths.

Countries have also used a mix of policy measures based on (i) defining a framework for promoting RE (ii) framing standardized PPA, (iii) determining tariffs from the beginning, and (iv) ensuring independent power producer access to the national grid. Two cases are elaborated below.

#### ***Standard Power Purchase Agreements (PPAs): Experience of Tanzania***

In Tanzania the government established a framework for the promotion of the development of small power projects using renewable energy technologies to accelerate rural electrification. Small power projects were defined as those with a capacity of 100 KW to 10 MW. The regulatory policy to support small private power project investments included the following:

- Standardized power purchase agreements for small power projects connected to the main grid or to isolated mini-grids.
- Standardized tariff methodology based on the principle of avoided costs of the buyer (which is the national utility company, TANESCO).
- Standard main and mini-grid tariffs subject to minimum and maximum prices established in the year of execution of the agreement and adjusted for inflation every year.<sup>30</sup>

The main principles reflected in the policy aimed at minimizing information required, reducing the regulatory requirements and decreasing the number of case-by-case

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<sup>30</sup> SADC, “SADC Regional Energy Access Strategy and Action Plan,” March 2010.

negotiations through the use of standardized documents. The principal aim of this flexible approach was to accelerate rural electrification by minimizing negotiation time and lowering the costs faced by local and international private investors.

Based on wide consultations with stakeholders the Energy and Water Utilities Regulatory Authority (EWURA), approved a standardized tariff methodology and set the power purchase tariff for 2009. The consultation process has also been the main approach used to develop rules and guidelines for small-power development, such as application procedures for necessary land and business permits and regulatory licenses, the minimum information exchanged between buyers and sellers, requirements for environmental and social impact assessment and mitigation, annual reporting, etc.

The tariff for projects connected to the grid is based on the avoided long-run marginal costs determined by the national power utility, TANESCO. The tariff for those connected to isolated mini-grids is based on the avoided costs of diesel generation and transmission. The mini-grid tariff is therefore significantly higher than that for the main grid. The mini-grid power purchase agreement includes provisions for automatic conversion to the main grid agreement on the date of interconnection of the isolated grid to the main grid. It is, however, not clear how the seller is compensated for any adverse financial and other consequences of such conversion.

A lesson from the Tanzanian experience is the importance of putting in place a policy framework that is flexible enough to address standard PPAs, standardized tariff methodologies and tariff setting as well as the importance of involving the public and other stakeholders in policy development process. Extensive stakeholder consultations were used as part of the policy development and standardized agreements proved to be an effective way of communicating government policy for the promotion of small private power projects.

### ***Energy Pricing and Subsidy Policies: Experience of Mauritius<sup>31</sup>***

In Mauritius, the Government (as the energy regulator) addressed the issue of energy pricing and power purchase agreements for bagasse-based cogeneration on the basis of the cost of a 22 MW diesel power plant and directed the utility, Central Electricity Board (CEB), to determine the tariff at the “avoided cost” for the diesel power plant, which in turn became a standard feed-in price for electricity generated by the sugar mills.

Energy prices in Mauritius are controlled by the government.<sup>32</sup> The Government has provided direct and indirect subsidies for energy services through explicit budgetary support to Parastatals, cross-subsidization and fiscal measures such as reduction or removal of duties. The specific measures undertaken for the most significant programs included the Bagasse Energy Development Program.

From the beginning of the sugar industry, bagasse has been used to meet most of the industry’s energy needs. When the sugar industry’s viability came under threat as a result of the phase out of preferential access Mauritian sugar to the European market, the Government, in partnership with the private sector, came up with a Sugar Sector Action Plan in 1988 which outlined a number of appropriate survival strategies that included the

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<sup>31</sup> SADC, “SADC Regional Energy Access Strategy and Action Plan,” March 2010.

<sup>32</sup> Mechanisms for controlling energy prices are the (1) Electricity and the Central Electricity Board (CEB) acts for electricity, and (2) consumer protection regulations (for petroleum products).

bagasse energy development program (BEDP) designed to create a significant alternative revenue source for sugar producers while reducing the country's dependence on imported fossil fuels.

To meet growing demand the utility at the time had the option of extending its diesel power plants or installing coal-fired plants, both options depending on imported fuels. The third and preferred option was to have the private sector develop bagasse cum coal generating plants that would export surplus power to the grid throughout the year.

To encourage the necessary private sector investments, the government introduced an IPP framework with tax incentives in favor of bagasse energy. These incentives included favorable prices for bagasse used for purposes other than sugar manufacturing. Electricity purchase prices were established on the basis of the avoided cost of diesel plant, and power. The IPPs (from 2000) were selected on the basis of competitive bidding by the government acting with technical advice from the CEB. As operating experience has been gained the price indexation formulae in the power purchase agreements have been re-negotiated to achieve more politically and socially acceptable rates of return.

In hindsight the government recognized the desirability of having an independent regulatory authority and is in the process of establishing one to provide for a better balance between investor and consumer interests. The new legislation will empower the Utility Regulatory Authority to examine any power purchase agreement and make appropriate recommendations to the parties to protect consumer interests.

A key lesson from Mauritius is that it is important to provide suitable incentives for private sector investment: Mauritius is highly ranked in terms of investment attractiveness. This focus on investment competitiveness is one of the reasons for the country's success in attracting private sector investment in power generation even before the implementation of the standard energy sector reforms, including an independent regulator and unbundling and commercialization of the power utility.

The representatives of the IPPs expressed so much confidence in the investment climate that they did not see much need for a regulatory body because they have not experienced serious problems in their energy investments and operations. Some of them even felt the regulator was not necessary as it was not likely to be truly independent and therefore its creation would only serve to introduce delays in decision making that could be counterproductive.

## **6. NEXT STEPS FOR ENERGY REGULATORS**

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Energy regulation and regulation of renewable energy in particular is a relatively new area in the management of the energy sector in the SADC region. Many countries are undertaking energy sector reforms that are leading to the creation of energy regulation agencies. To date, eleven SADC countries out of fifteen have established energy or electricity regulatory agencies while the remaining ones are in the process of doing so.

Because the renewable energy sector has played an insignificant role in the energy sector in the past, regulators face huge challenges in many areas that include energy policy inadequacies that provide little guidance for regulating the renewable sector, inadequate human and technical skills to effectively deal with existing and emerging issues such as

appropriate tariffs for electricity generated from renewable sources of energy, data inadequacies regarding the renewable energy resource base, absence of adequate regulatory tools, and mechanisms for promoting increased investment in renewable energy. These capacity inadequacies will need to be addressed if the envisaged role of regulators in promoting the wider deployment of renewable energy technologies is to be realized.

Development and utilization of the abundant renewable energy resource has a critical role to play in enhancing security of supply, economic growth, jobs and poverty reduction. Renewable energy also has the potential to contribute significantly to the improvement of social conditions as well as contributing to the reduction of emissions and related global warming and climate change. Regulators, by pursuing the right regulatory policies and providing a regulatory framework for increased private sector in the renewable energy sector, have a direct role in achieving the overall objectives outlined above. In order to do this the current policy, institutional and human resource constraints need to be addressed. Some of the steps along this capacity building process are outlined below.

### **6.1. Policy, legal and regulatory framework**

The legal and regulatory framework specifically addressing renewable energy continues to be very limited and needs to be improved. With the notable exception of South Africa, SADC member states regulatory agencies need to develop tools and a regulatory environment to encourage efficient development and operationalization of renewable energy technologies. Some of the next actions regulatory agencies need to take include:

- Review the policy regulatory framework for wide use and dissemination of clean energy. In this context a key role of energy regulators for the purpose of advising governments on the efficiency and effectiveness of the existing policy and legal frameworks.
- Develop appropriate policy, legal and institutional framework for promoting the development clean energy.

Well-articulated policy and legal frameworks will contribute to the development and promotion of a clean energy strategy and guide the actions of industry players. A sound legal framework will help create certainty, ensure predictability of regulators' actions and improve confidence that decisions are made on a level playing field.

### **6.2. Development of Mechanisms for promoting Renewable energy**

Many of the mechanisms for renewable energy regulation described above may not be immediately applicable in the region in the short term due to the current structures of the electricity industry in the region. However, several countries have embarked on formulating Feed-In-Tariffs. Capacity building is necessary for many of them to equip regulatory institutions with tools for designing appropriate regulatory and policy support mechanisms. Regulators will need to take steps in the following areas:

- Review and update the national renewable energy data base.
- Review the barriers and issues constraining the wider use and dissemination of clean energy technologies.

- Review the regulatory and institutional structures for the promotion of clean energy and restructure where necessary to include renewable energy functions.
- Review and develop human capacity to undertake clean energy regulation functions. Regulators will need to identify training needs for their institutions and mobilize resources for acquiring relevant skills.
- Develop suitable tools and mechanisms such as FITs for promoting different types of RETs.
- Develop institutional strategic plans that will set the pathway for promoting RETs.
- Develop suitable grid codes and guidelines to allow access to the national grid by independent producers.

### **6.3. Coordination of Energy and Environmental Regulation**

In most SADC countries energy and environment institutions and activities fall under separate Ministries yet clean energy transcends these institutional structures. Clean energy has a critical role to play in improving energy supplies as well as improving the environment through the reduction of fossil fuel emissions and slowing deforestation. Effective policies to promote clean energy investment will require enhanced cooperation and coordination between energy and environment regulators in the design of appropriate regulatory and policy support mechanisms that will help increase the wider deployment of clean energy technologies.

- Regulators will need to create a coordination and consultative mechanism involving public and private institutions with a bearing on clean energy development to shape and implement appropriate regulatory and policy support mechanisms for clean energy development.

## ANNEX 1: GLOSSARY OF TERMS

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**Best practice:** Generally accepted approaches, methods or processes that have proved themselves over time to accomplish certain objectives.

**Biofuel:** Fuel derived from biomass which includes vegetable oil, biodiesel, bio alcohols such as ethanol, and biogas from anaerobic digestion of organic materials.

**Bioenergy:** Renewable energy derived from biological sources synonymous to biofuel.

**Biomass:** Biological material derived from living, or recently living organisms including plant and animal material.

**Clean energy:** Energy derived from sources regarded as non-pollutant such as solar, wind, hydropower, geothermal and bioenergy sources.

**Climate change:** Any significant and long lasting change in average temperatures and precipitation associated with the accumulation of greenhouse gases within the earth's lower atmosphere.

**Co-generation:** Simultaneous production of electricity and solar heat energy.

**Commercial energy:** High-quality and efficient energy sources usually traded in the open market, for example electricity and petroleum products. The term excludes traditional energy sources such as unprocessed biofuels.

**Concentrating solar power:** Technologies using mirrors to reflect and concentrate sunlight onto receivers that collect the solar energy and convert it to heat. This thermal energy can then be used to produce electricity via a steam turbine or heat engine driving a generator.

**Economic growth:** A widely-used measure of the process by which a nation increases its wealth over time. A real rate growth is represented a country's total output of goods and services usually over a period of one year.

**Energy demand (millions toe):** The amount of modern energy required for the various sectors of a country.

**Energy regulation:** Legislative framework that governs a country's use and taxation of both renewable and non-renewable energy.

**Energy regulator:** The agency in charge of monitoring the energy sector.

**Feed-in-tariffs:** A policy mechanism designed to accelerate investment in renewable energy technologies. The scheme offers cost-based compensation to renewable energy producers, providing the price certainty and long-term contracts that help finance renewable energy investments.

**Flexible regulation:** Refers to the balancing of social goals of a country's energy regulations with the needs and capabilities of independent power producers without undermining the broad purposes of the regulations.

**Global warming:** A sustained increase in the average temperature of the earth's atmosphere sufficient to cause climatic change.

**Green energy:** Energy derived from sources regarded as non-pollutant, such as from anaerobic digestion, solar energy, biomass power, geothermal, hydropower, tidal power, and wave power. Some definitions include power derived from the incineration of waste.

**Green certificates:** A tradable commodity proving that certain electricity is generated using renewable energy sources.

**Gross domestic product:** The total output of goods and services produced within the domestic territory of a given country.

**Gross national product:** The total output of goods and services produced within the domestic territory of a given country (GDP), plus the net receipts of primary income from investments outside the country.

**Hydroelectric power / hydropower:** Energy derived from the flow of water (from the hydrological climate cycle, powered by the sun), which is used to turn turbines that produce electricity.

**Incentive:** Any policy, rule, pricing mechanism, process or procedure that aims to influence the decision of an entity by changing the marginal costs or marginal benefits associated with particular decisions and activities.

**Independent power producers (IPPs):** Privately owned power companies that produce electricity and sell it for a profit to the national grid or to a distribution utility.

**Interconnected system:** An integrated electricity generation, transmission and distribution network.

**Legal and regulatory framework:** Combination of laws, institutions, rules and regulations governing the operations of the electricity industry.

**Micro hydro:** Small-scale power generating systems that harness the power of falling water (above 100kW but below 1MW).

**Photovoltaic (PV) cell:** A device (panel) that converts solar energy directly into electricity.

**Photovoltaic (PV) solar power:** electricity generated from the use of photovoltaic cells.

**Power purchase agreement (PPA):** Contracts (differentiated by the source of electricity harnessed) between the producer of electricity (the seller) and the purchaser of electricity (the buyer). Various forms of such agreements are differentiated by the source of energy harnessed, such as solar, wind, etc.

**Renewable energy:** Energy which comes from naturally replenished resources such as sunlight, wind, rain, tides and geothermal heat.

**Renewable energy technology:** Devices that utilize renewable energy resources, such as solar panels and wind turbines.

**Small hydro:** Small-scale power generating systems that harness the power of falling water (1-15MW).

**Smart subsidies:** A process used to provide the minimum required capital subsidy to bridge a defined access gap using a comprehensive bidding process known as least cost subsidy auction.

**Solar energy:** energy from the sun used to generate electricity and to heat water; can be converted into three types of energy: solar thermal, solar photovoltaic and concentrated solar.

**Solar thermal energy / solar heat energy:** Solar energy converted to heat; aimed at household populations, can take the form of solar space, water and pool heating and solar thermal cooling.

**Southern African Power Pool (SAPP):** An integrated network of electricity transmission lines linking several eastern and southern African countries.

**Sustainable energy development:** Implies meeting today's energy needs without compromising the needs of future generations.

**Traditional energy:** Low-quality and inefficient sources of energy, predominantly biomass in nature and not often traded (for example, wood fuel, crop residues and dung cakes).

**Vertically integrated utility:** An entity that undertakes electricity generation, transmission and distribution.

**Watt-hour (Wh):** A unit of energy equal to a power of one watt operating for one hour.

**Wind energy / wind power:** Energy generated from wind turbines.

## ANNEX 2: REFERENCES

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- Economic Commission for Africa (ECA), "Sustainable Energy: A Framework for New and Renewable Energy in Southern Africa," March 2006.
- Lemaire, Xavier, "Case Study: Photovoltaic Energy Service Companies in Zambia," Centre for Management under Regulation, Warwick Business School, 2006.
- "Report of the Proceedings of the 2nd Annual Conference of the African Forum for Utility Regulators (AFUR)," Kampala, Uganda, 14-18 March 2005.
- RERA, "Electricity Tariffs and Selected Performance Indicators for the SADC Region," 2010 (draft publication).
- SADC, "Press Release: 32<sup>nd</sup> SADC Energy Ministers Meeting, Gaborone, Botswana," 26 May 2011.
- Online at [www.sadc.int/news/32nd-sadc-energy-ministers-meeting/](http://www.sadc.int/news/32nd-sadc-energy-ministers-meeting/).
- SADC, "Energy in South Africa: Expanding Energy Generation Capacity in SADC," *Energy Policy Brief no. 1*, August 2010. Online at [www.sardc.net/sadc-energy/poily%20brief%20No%201.pdf](http://www.sardc.net/sadc-energy/poily%20brief%20No%201.pdf)
- SADC, "Regional Access Strategy and Action Plan," March 2010.
- Online at [http://euei-pdf.org/uploads/media/SADC\\_Regional\\_Energy\\_Strategy\\_and\\_AP\\_Final-2010.pdf](http://euei-pdf.org/uploads/media/SADC_Regional_Energy_Strategy_and_AP_Final-2010.pdf)
- SADC, "SADC Infrastructure - Development Status Report for Council and Summit," SADC, Gaborone, September 2009.
- SADC, "Regional Indicative Strategic Development Plan (RISDP)," 2003.
- SADC, "Protocol on Energy," 1996.
- SADC, "Southern African Development Community Regional Indicative Strategic Development Plan (RISDP)," 2004. Online at [www.sadc.int/index/browse/page/104](http://www.sadc.int/index/browse/page/104).
- M. Tse, *Energy and Renewable Energy Technologies (2006), Capacity Building in Energy Efficiency and Renewable Energy Regulation and Policy-Making in Africa. Case Study 2: Ghana Wind Energy Project.*
- Global Environment Facility (GEF) Appendix L: Small Hydropower Experience in South Asia. GEF, Washington (unpublished), 2006.
- World Bank, "Promoting Region Power Trade – the Southern Africa Power Pool," *Viewpoint*, 1998.

### Internet Resources

- Information on regulated industry: [www.utilityregulation.com](http://www.utilityregulation.com)
- African Forum of Utility Regulators: [www.afurnet.org](http://www.afurnet.org)
- Centre of Regulation and Competition: [www.competition-regulation.org.uk](http://www.competition-regulation.org.uk)
- European Renewable Energy Council (EREC): [www.erec-renewables.org](http://www.erec-renewables.org)
- European Energy Regulators (CEER): [www.ceer-eu.org](http://www.ceer-eu.org)

Electricity Control Board of Namibia: [www.ecb.org.na](http://www.ecb.org.na)

Energy Regulation Board of Zambia: [www.erb.org.zm](http://www.erb.org.zm)

Global Regulatory Network: [www.globalregulatorynetwork.org](http://www.globalregulatorynetwork.org)

Intergovernmental Panel on Climate Change (IPCC): [www.ipcc.ch](http://www.ipcc.ch)

National Association of Regulatory Utility Commissioners (NARUC): [www.naruc.org](http://www.naruc.org)

Public Utility Research Center: [www.purc.org](http://www.purc.org)

Public Utility Research Center: [www.purc.org](http://www.purc.org)

Regional Electricity Regulators Association of Southern Africa (RERA):  
[www.rerasadc.com](http://www.rerasadc.com)

Renewable Energy and Energy Efficiency Partnership (REEEP):  
[www.reeep.org/groups/sern](http://www.reeep.org/groups/sern)

United Nations Framework Convention on Climate Change (UNFCCC): <http://unfccc.int>

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