Perspectives on Energy Security and Renewable Energies in Sub-Saharan Africa

Practical Opportunities and Regulatory Challenges

Second Revised and Expanded Edition

Edited by
Oliver C. Ruppel & Bernd Althusmann

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FOREWORD TO THE SECOND EDITION

Various international processes and the vigorous engagement of multilateral development organisations provide an impressive demonstration of the growing importance attached by humankind to the challenge of sustainable energy supply.

For years, climate change and its consequences have been one of the biggest challenges facing Africa and have been the subject of debate. In the past, Namibia's energy supply has not played a major role in social and political debates. Fuel and most of the country's electricity are imported from its neighbours, especially South Africa. Over time, however, people have changed the way they think about the issue. Namibia's National Development Plan (NDP4, Vision 2030) fully recognises the importance of sustainable development, and particularly the role of renewable energy, though these have not yet led to the desired scope of expansion in production capacity.

On 14–15 April 2014, the Konrad Adenauer Foundation co-hosted a two-day conference in the National Assembly on the importance and foreseeable consequences of climate change for southern Africa, as well as the opportunities offered by renewable energies. The goal was to elaborate on the status quo of renewable energy in Namibia, as well as to consider problems and possible ways of overcoming these problems in order to promote the use of renewable energy in Namibia. The conference, among others, considered the current status of the energy sector in Namibia; energy options available in Namibia; the current status of the Independent Power Producer Framework; success stories and challenges experienced; renewable energy feed-in tariffs; and regional experiences and lessons from other countries.

With input from a broad cross-section of energy sector stakeholders, local and international experts and members of the public, the conference agreed that the use of renewable energies must be developed in order to help reduce poverty and to combat climate change. Corresponding political strategies were further elaborated on at the conference, and concrete steps were adopted to pass a new law on energy security. The declaration, which was passed in June 2014 by the Parliamentary Conference, calls on parliament and government to show greater recognition of the consequences of climate change for the country and to institute a legislative initiative for better use of renewable energies. In addition to a large number of specific implementation measures, such as increased exploitation of solar energy (Namibia has the highest number of sunny days of any country in the world), and grid expansion and tariff fees as intermediate steps on the path to an energy feed-in law, the declaration also aims to bring younger generations on board by making climate change and sustainable solutions for energy security a part of every subject in all schools.

There is enormous potential in expanding the exploitation of renewable energies in Namibia. Therefore Namibia has taken its first step towards a slow but steady switch to renewables.

The recent discussion initiated by the Konrad Adenauer Foundation in the Namibian parliament signalled the start of a long overdue and serious look at the consequences of global climate change and the opportunities offered by renewable energies. This conference, Namibia's first on energy issues, revealed that Namibia clearly has the desire to take on a new leading role in renewable energy development issues in sub-Saharan Africa, especially given that the country is ideally equipped in terms of natural resources to ramp up its use of renewables.

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FOREWORD TO THE FIRST EDITION

Energy security is one of the most important future challenges for the international agenda of security, peace, and stability worldwide. Increasing energy supply needs and the aim of achieving greater energy independence are playing a mounting role in politics, not only in the United States, Europe, Russia, China and India, but also in Africa as the continent with the highest potential for energy resources for the future.

The quest for control and commercialisation of energy resources is also a reality in sub-Saharan Africa. Nigeria and Angola are the biggest oil-exporting countries after the countries of the Middle East. Namibia is one of the biggest uranium-exploiting countries, while Tanzania may in future become one of the most important gas-exporting African countries to world markets. The United Nations forecasts that the African population will be around 2 billion people in 2050, and therefore the expanding demand for energy will be one of the challenges with which Africa is faced, along with poverty reduction, food security, water security and combating the impacts of climate change. But Africa's challenges are also world challenges, because energy security is a global priority, with global markets, interests and needs.

More than ever, a reliable discussion about the importance of coordinating secure energy supplies worldwide, and especially the impact on Africa, is essential for the future of this continent, as part of the international energy security structure. The African Union represents a continent which is faced with different aims, security interests and needs, if one compares the destabilising developments over the past 10 years in the north, south, east and west of Africa. Which path will Africa take in respect of rapidly growing energy demands on the continent – the European or the Asian path?

The energy demand worldwide "is expected to increase by 27% by 2030, with important changes to energy supply and trade flows".[1]

> In times of global unrest and crises the aspect of energy supply security becomes more critical. Power politics and territorial interests as well as new extraction technologies may cause controversies between political, economic and civil society actors. With regard to the adjacent security and regulatory challenges, a reliable and climate-friendly energy supply is required. In that respect, intergenerational equity and the integrity of creation should serve as key motives.[2]

Pressures linked, for example, to agriculture, food security, water scarcity and energy

1 See Communication from the Commission to the European Parliament and The Council, 2014, European Energy Security Strategy, COM/2014/0330 final, available at http://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:52014DC0330&from=EN, last accessed 10 February 2015, 1.

2 Konrad-Adenauer-Stiftung, 2015, International Report on Resources, Energy and Law, 1/15, available at http://www.kas.de/wf/doc/kas_40185-544-2-30.pdf?150126095215, last accessed 30 January 2015.

demand are also increasing in Africa, not only putting ecosystems at risk.[3] Energy security is the indispensible presupposition for stabilising democracy and economic growth, and for reducing poverty and the impacts of climate change. In Europe the debate about "energy security independence or interdependence?" has been ongoing.[4] In sub-Saharan Africa the short- and long-term obligation to decide the way forward currently forms part of the priority agenda on energy security in 2015. Prosperity and stability can only grow in southern African countries if there is a stable and abundant supply of energy. The dependency on foreign energy imports, in combination with insufficient electricity supplies, will inevitably and primarily affect the poor and the employment sector. The more energy prices increase, the higher the unemployment rate, which is already alarming in many countries of sub-Saharan Africa.

How many of the people living presently in sub-Saharan Africa do really have secure and constant access to electricity; and what is really needed in this regard in the near future? Needless to say, developing countries are the most vulnerable to energy and power failures, despite their wealth in energy resources. They are probably depending on large energy imports from other countries and have to face a projected increase of energy prices on a national level. Energy security issues will, however, in all likelihood only be solved in cooperation between several countries, for instance the Southern African Development Community (SADC) member states.

An applicable saying from Kiswahili points out that "together we can make a difference". In around 100 countries worldwide the Konrad-Adenauer-Stiftung (KAS) contributes to the promotion of democracy, rule of law, and social market economy. As a political foundation and a well-known think tank, KAS cooperates with different organisations in political fields like good governance, human rights, gender equality, adult education, climate change, and energy. The Development and Rule of Law Programme (DROP) at Stellenbosch University in South Africa researches and promotes sustainable development law and policy, focusing on reconciling the tensions between environmental sustainability, economic development, and human welfare, with a holistic view of current legal, political, economic, social, and cultural developments. With its "law-for-development, investment-for-the-poor, and policy-for-society approach", DROP facilitates knowledge transfer by deepening existing and establishing new partnerships with policy makers, governments, diplomatic corps, commerce, industry and academic institutions – particularly on the African continent. Together KAS and DROP provide

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3 Niang, I. & O.C. Ruppel, 2014, Africa, in: Barros, V.R., C.B. Field, D.J. Dokken, M.D. Mastrandrea, K.J. Mach, T.E. Bilir, M. Chatterjee, K.L. Ebi, Y.O. Estrada, R.C. Genova, B. Girma, E.S. Kissel, A.N. Levy, S. MacCracken, P.R. Mastrandrea, & L.L. White (eds), *Climate Change 2014: Impacts, Adaptation, and Vulnerability – Part B: Regional Aspects*, Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge, Cambridge University Press, 1199.

4 Munich Security Conference, 2015, Energy Security: Running out of St(r)eam?, in: Munich Security Report 2015, available at http://www.eventanizer.com/MSC2015/MunichSecurityReport2015.pdf, last accessed 10 February 2015, 42.

expertise and a platform for public discussions. They have joined forces in supporting sub-Saharan Africa towards a stable energy supply and energy security for the future.

On 11 September 2014, we invited highly respected experts to a conference on energy security in Windhoek, Namibia. The contents and results of this conference are reflected in this publication and underline the importance of energy security for the ongoing development of sub-Saharan Africa. As the editors of this publication, we are grateful to the contributors for their commitment and expertise, which are so remarkably reflected in this book.

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SECTION I:
CHALLENGES AND OPPORTUNITIES

1.
GERMAN-NAMIBIAN COLLABORATION IN ENERGY ISSUES

Ullrich Kinne

1 Introduction

Today, around two billion people worldwide are living without access to a modern energy supply. This means they have no opportunity to lift themselves out of poverty and improve their living conditions through their own efforts. Providing these people with a sustainable energy supply is the key to reducing global poverty. This is why promoting renewable energies and energy efficiency is an objective of German development policy.

A sustainable energy supply not only reduces poverty, it also reduces dependency on costly fossil fuels, especially oil. It helps to protect the environment – both locally and globally. Germany therefore supports the dissemination of sustainable and local energy production technologies, and aims to help achieve efficient energy production and utilisation.

2 Aspects of German Development Policy in Energy Issues

Various international processes, and the vigorous engagement of multilateral development organisations, provide an impressive demonstration of the growing importance attached by humankind to the challenge of sustainable energy supply. A leader in the use of innovative renewable energy technologies, the German government is playing a major role in helping to define international targets and implement concrete measures. Cooperation activities are being pursued at the level of the EU, within the G8, and together with the World Bank and the regional development banks. German development policy is also promoting cooperation with global networks and public-private partnerships. The Federal Ministry for Economic Cooperation and Development (*BMZ*) is supporting energy projects in more than 50 partner countries, as well as numerous regional and global programmes. In order to expand cooperation in the energy sector into a strategic partnership with developing countries, the German government has in recent years launched numerous initiatives and made extensive funding available.

In June 2004, more than 3 600 high-ranking representatives of governments, international organisations, business associations and non-governmental organisations from 154 countries met by invitation of the German government at the International Conference for Renewable Energies in Bonn – referred to as 'Renewables 2004', for short. The conference concerned itself with the key issue: How can the share of renewable energies be significantly increased in industrialised and developing countries, and how can the energy potentials of the sun, wind, water, geothermal heat and biomass be better harnessed?

The delegates agreed that the use of renewable energies must be developed in order to help reduce poverty and protect against climate change. Corresponding political strategies were further elaborated upon at the conference, and concrete steps were adopted. An International Action Programme (IAP) was drawn up, summarising 200 measures, development targets and voluntary commitments by individual countries, regions and international organisations.

3 The Special Facility for Renewable Energies at the German Development Bank

A key contribution by Germany was the creation of a special facility for renewable energies at the German Development Bank (*KfW*) in 2005. Its funds of EUR500 million were used to help develop renewable energies and improve energy efficiency in emerging and developing countries. This money was made available in addition to a fund of EUR1 billion for renewable energies and energy efficiency pledged at the Johannesburg World Summit in 2002. Owing to the huge demand, *KfW* has continued the work of the Special Facility by launching the Initiative for Climate and Environmental Protection, which is also active in Namibia.

4 The International Climate Initiative

The International Climate Initiative (*IKI*) supports climate and biodiversity projects in developing countries, emerging economies and countries in transition since it has been launched in 2008. Until the end of 2014 total funding for activities under the *IKI* amounted to EUR1.6 billion for 446 activities. The following are the focus areas of the *IKI*:

- mitigating greenhouse gas emissions;
- adapting to the impacts of climate change;
- conserving natural carbon sinks with a focus on reducing emissions from deforestation and forest degradation (REDD+); and
- conserving biological diversity.

So far, only one *IKI* project has been supported by the German government in Namibia, but there is room for more.The projects are based on the needs of partner countries and supplement existing multilateral and bilateral cooperation with the German government.

IKI supports partners primarily through technology cooperation, policy advice and capacity development, the preparation of studies and strategies, and the implementation of measures for climate protection and conserving biodiversity, including the promotion of renewable energies and energy efficiency.

The German Federal Ministry for the Environment, Nature Conservation, Building and Nuclear Safety (*BMUB*) principally selects projects for IKI funding through a call for proposals.

The selection process consists of two stages:

In the first stage, *BMUB* usually issues an annual call for proposals along with the corresponding support information. Those interested may submit project outlines in German or English before a set deadline usually ending in May for the following year. These must be prepared using the project outline templates available on the IKI website. *BMUB* evaluates all project outlines in this format that are complete and were submitted to the IKI Programme Office in time. The Ministry makes its selection based on the funds available and seeks the approval of other relevant ministries. Applicants are informed in writing of the evaluation result.

In the second stage, applicants whose projects were selected are requested to submit a formal funding application in writing and receive the necessary templates and instructions. *BMUB* evaluates the project applications received and then makes the decision on funding. If a project requires a letter of political support from a partner country or guarantees under international law, this has an effect on the project's start date.

5 The Global Network on Energy for Sustainable Development

The Global Network on Energy for Sustainable Development (GNESD) networks with various actors from developing and industrial countries that conduct policy analyses on access to energy, environment and development. It supports national competence centres that design sustainable development strategies, by providing them with international contacts and facilitating the transfer of expertise. The network focuses on needs-based environmentally friendly energy supply to help reduce poverty and achieve the Millennium Development Goals. The GNESD is based with the United Nations Environment Programme (UNEP), and is supported by the United Nations Development Programme (UNDP), the United Nations Foundation (a foundation that promotes the work of the UN) and various national donors.

6 African Development Bank Projects

In its capacity as shareholder of the African Development Bank (AfDB), the German government has called for greater use of renewable energies in Africa, and for climate issues to be addressed systematically.

The Bank has devised a Clean Energy Investment Framework (CEIF). This focuses on the utilisation of hydropower potential. Furthermore, the Bank also sees geothermal energy, solar energy and wind energy as a worthwhile activity area. The AfDB plans to promote investment projects and measures to create more conducive frameworks for private investment. The CEIF also includes a proposal for a multi-donor trust fund for clean energy access and climate adaptation for Africa. In parallel to the CEIF, the

Bank intends to put forward a climate change risk management strategy, and to design a comprehensive action plan on clean energy and climate change.

7 Private Sector Involvement

The *BMZ* has set itself the target of not only developing governmental cooperation in the energy sector, but also increasing the involvement of the private sector in development policy activities. To this end, the Ministry and its implementing organisations *KfW* and *Deutsche Gesellschaft für Internationale Zusammenarbeit* (*GIZ*) have intensified dialogue with various trade associations. This dialogue aims to establish contacts between companies in industrialised states and developing countries. These contacts make it possible, for instance, to implement projects with solar energy or wind energy companies in which entrepreneurship and development benefits go hand in hand, within the framework of public-private partnerships (PPPs). In recent years, public-private partnership projects of this kind have been supported, for instance, in Ghana, Mali, Senegal, South Africa and Tanzania. There, solar power systems have been installed in rural areas.

8 German-funded Energy Projects in Namibia

A multitude of projects have been supported by the German government to assist Namibia on its way to cleaner and more sustainable energy.

On 25 June 2015, Minister of Finance Calle Schlettwein and German Ambassador Onno Hückmann signed an intergovernmental agreement on financial cooperation between the Republic of Namibia and the Federal Republic of Germany for a loan of EUR45 million (approximately NAD610 million) for the energy sector.

The preferential loan is to be used to finance projects on renewable energy and energy efficiency in Namibia through NamPower. The main objective of the programme is to ensure stable and reliable power supply for Namibia in the short- and medium-term and to support a sustainable long-term power mix consisting of renewable and fossil elements. Both approaches are flanked by initiatives to increase energy efficiency.

Specific projects to be funded through the programme are the rehabilitation of three turbines at the Ruacana hydro power plant and the construction of transmission lines from Gerus to Otjikoto and Kuiseb to Walvis Bay.

About EUR8 million (approximately NAD110 million) are allocated for demand side management. This will include NamPower's initiative to exchange one million light bulbs in households with energy-saving LEDs free of charge and a programme to subsidise the replacement of 20 000 traditional electric geysers with energy-efficient solar water heaters.

As energy is an enabler of economic growth, this agreement will play a vital role in reducing the dependency on power imports, supporting Namibia's promising economic development and transformation into a modern, diversified economy.

A German-funded debushing project has been exploring the commercial viability of using encroaching bush for energy generation. The following may illustrate the impact of bush encroachment and de-bushing: The carrying capacity of rangeland, and productivity of land in a wider sense, has been reduced by two-thirds, i.e. it is only one-third of previous levels. The economic loss through reduced meat production only is estimated to exceed NAD1,5 billion per annum. The de-bushing of 1% of currently bush-encroached area of 30 mio ha would, besides its potential energy benefits, create employment for between 400 and 30 000 people, depending on the degree of mechanisation, and increase the recharge of groundwater to an extent of about 300 mio qm per annum which equals the volume of the Hardap Dam.

Admittedly, most figures are based on limited scientific evidence and can be disputed in absolute terms. The significance of de-bushing however remains undisputed.

It is encouraging in this context that in 2015, Nampower, with support from KfW, established a dedicated biomass project and aims to conduct a bankable feasibility study of decentralised 5–20 MW biomass power plants. The Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) projects cooperate closely by strengthening the biomass supply sector and operations to meet the demand of large-scale off-takers. In August 2015, Nampower tendered the supply of alternative or supplementary fuel(s) for testing purposes at the Van Eck Power Station, which is an initiative that could potentially open up an immense opportunity and which, with the support of GIZ, is incorporating the biomass industry through the Namibia Biomass Industry Group (N-BIG, Section 21 not for gain). N-BIG will serve as an institutional framework that enhances cooperation of the industry stakeholders in fields such as marketing and sales, upscaling of capacity, and R&D in equipment and products.

Other major German-funded energy projects in Namibia in the past were extensions to the Ruakana power plant worth EUR42 million, and the 'Caprivi-Link' project worth EUR40 million, which has allowed increased energy imports from Zambia. Furthermore, the German-funded project for the creation of an urban traffic master plan for Windhoek has the potential to contribute to a more efficient traffic infrastructure, which will result in considerable energy savings.

9 The Way Foreward

During the visit of Brigitte Zypries, parliamentary state secretary in the German Federal Ministry for Economic Affairs and Energy, to Namibia in July 2015, long-term energy security was identified as one of the major factors for consideration by German companies when making investment decisions. German companies in the renewable energy sector offer leading-edge technology worldwide.[1] A business delegation from leading German

1 See http://www.renewables-made-in-germany.com/ for company profiles and product presentations from Germany, plus information about the activities being conducted by the Renewable Energies Export Initiative in other countries, put together by the Deutsche Energie-Agentur (dena – Germany Energy Agency). At the virtual marketplace http://www.renewablesb2b.com/, business contacts can be initiated directly. Furthermore,

companies in the area of renewable energy to Namibia is under consideration for 2016.

Foreign direct investment into renewable energies in Namibia and the efficient application of up-to-date energy solutions require a conducive regulatory and public policy framework. And, of course, it is important that existing investment protection agreements are upheld. Besides these regulatory aspects which require ongoing attention, there are two major hurdles which still prevent renewable energies from claiming their rightful place in Namibia's energy mix: One is the lack of an economically viable feed-in tariff and the other is the cap of 10% on the share of renewable energies in the country's future power generation.

The German Foreign Office has agreed to support a trip to be organised by the Konrad Adenauer Foundation for members of the Natural Resources Committee of the Namibian Parliament to visit Germany in order to familiarise themselves with renewable energy legislation, including feed-in tariffs, in Germany, so that they can take an informed decision and vote on similar legislation in Namibia.

Until the adoption of a feed-in tariff law, it is imperative to ensure the swift construction of photovoltaic (PV) power plants for which licences have been issued under the Independent Power Producer (IPP) Platform. Out of 27 licences issued so far, only one PV power plant has actually been built and another one is under construction. To speed up the process, licences should only be issued to qualified companies with proven experience in the field. German companies in particular are known for their strong training components and employment creation impact of their activities. It is encouraging that NamPower has agreed to take up the energy generated through these licences in its grid.

Regarding the 10% cap, new storage technologies and the integration of energy markets should allow a higher share of renewable energies in overall power generation. It is encouraging that 83% of newly commissioned energy generation capacity within the SADC member states in 2014 is from renewable energy sources. Germany is prepared to assist Namibia in this regard as well.

It can be summarised that the German government has contributed substantially to develop renewable energies and to improve energy efficiency in Namibia. Many energy related projects are being supported and it is encouraging that – besides the continuos financial support – further cooperation activities are envisaged for the near future, where technological and regulatory possibilities can be presented and discussed.

the aforementioned website provides comprehensive information about current sector news from across the world and on international events such as fairs, conferences and training activities, as well as the special business marketplace of the German Chambers of Commerce (AHK).

2.
THE STATE OF RENEWABLE ENERGY TECHNOLOGIES AND APPLICATIONS IN SUB-SAHARAN AFRICA – WHERE DO WE STAND, AND WHERE DO WE GO?

Zivayi Chiguvare & Theodora M. Chiguvare

1 Introduction

Electricity is a major ingredient for economic growth and, without access to it, most of the sub-Saharan African countries' participation in the world economy will remain marginal. They will remain net exporters of raw materials, and net importers of finished products and outsourcers of services, thereby impoverishing their nations. Namibia imports 100% of its oil and gas requirements, and more than 60% of its electricity demand. This electricity demand satisfies the needs of only about 44% of the population living mainly in the urban centres. Namibia is endowed with abundant sunshine, and other natural energy resources, like wind and biomass. Even the Benguela current in the Atlantic Ocean provides excellent opportunities to harness the kinetic energy of the water and to convert it to electricity. Proven gas reserves off the Atlantic coast could generate up to 800 MW of electricity for at least 15 years, yet the majority of the Namibian population continues to rely on natural flows of energy and has no access to modern energy supply in the form of electricity. They rely on traditional sources of energy such as direct sunshine and firewood. Real opportunities, however, exist, and Namibia could become the example of 100% electrification in sub-Saharan Africa.

Every advanced economy has required secure access to modern energy to underpin its development and growing prosperity. Modern, high-quality and reliable energy is essential for better health, higher incomes, and all-round improvements in the quality of life. This includes all emotional, social, and physical aspects of the individual's life, of which some examples are healthcare, nutrition, sense of acceptance by intimate others, activities that promote relaxation and stress reduction, and the provision of clean water, etc. Modern energy supports development through the provision of the means for reliable and efficient lighting, heating, cooking, mechanical power, transport, and telecommunication services. Access to affordable and reliable energy services is fundamental to reducing poverty and improving health, increasing productivity, enhancing competitiveness, and promoting economic growth.

Sub-Saharan Africa has yet to overcome the obstacle of energy poverty. The old

Zimbabwean proverb “Human relationships are always partially complete, until there is food sharing” could be extended to “until there is food and thermal comfort”, i.e., energy sharing. People need sustenance and thermal comfort to remain alive. Both of these resources are necessary conditions for life, and water is the medium, which enables food intake. When the conditions of food and thermal comfort are met, people can live and reproduce, with successive generations labouring to provide the conditions of food and thermal comfort for their descendants. People seek food and thermal comfort from birth till death.

Communities build houses to store their food supplies and to protect themselves from extreme temperatures. Energy is a critical enabler that facilitates the cultivation of food, its transport from afar, its preparation, and its preservation over long periods of scarcity, as well as the manufacture of adequate clothing. Energy is also used to protect life and safeguard life’s necessities from harm. Plants and animals, too, need food and thermal comfort to survive. Prolonged inadequacies of these essentials result in hardship and death.

Many wars that have been fought are related to energy, where one people encroaches on the territory of another, to access food and energy. The amount of energy that one group has control over is directly related to the power that it has over others. Nations fight to their death when their energy supplies are threatened.

Renewable energy resources are widely distributed geographically, and it is difficult for a specific nation to contain renewable resources, or to deprive others of them. Therefore technologies that harness these resources, though still confined to developed states, offer a ray of hope to developing regions, such as sub-Saharan Africa, where millions of people dream of universal access to modern energy systems and to eventually harness their own renewables resources.

2 Where Do We Stand?

Figure 1 shows the correlation between access to electricity and poverty levels in various countries. It is clear that if the energy access levels are high, then the percentage of the population living in poverty is lower. Namibia is in the bottom left corner of the figure, which is undesired – the ideal situation is to be on the top right, where 100% of the population has access to electricity, and other modern energy services, and 0% of the population lives in poverty. The majority of sub-Saharan African countries falls in the bottom left quarter, and hence, in general has lower quality of life, in comparison to OECD countries, for example. The circle indicates the position of Namibia then. It is gratifying to note that by end of 2015, the percentage of the population with electricity access in Namibia had risen to 47%, which is indeed, a step in the right direction.

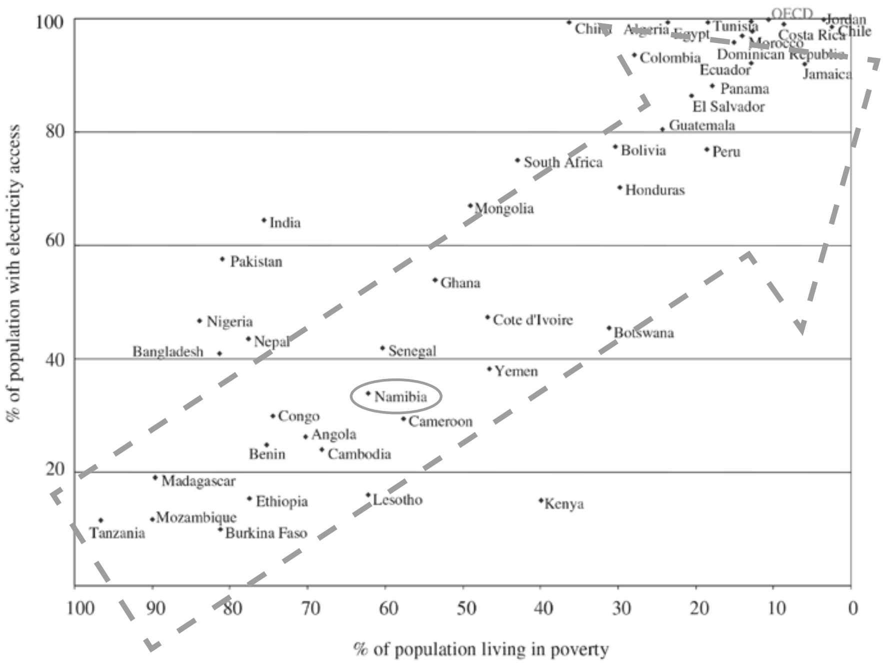

Figure 1: Correlation between energy access and economic prosperity
Development in the direction of the arrow (inserted by the authors) is desired
Source: GEA (2012:165).

3 Energy Access

Sub-Saharan Africa's rates of access to modern energy are extremely low, indeed they are the lowest in the world, and there do not seem to be sufficient efforts by the locals themselves, nor by foreign sympathisers, to address these inadequacies.

***Table 1:** Electricity access in 2012 – Regional aggregates*

Region	**Population without electricity (million persons)**	**Electrification rate (%)**	**Urban electrification rate (%)**	**Rural electrification rate (%)**
Developing countries	1 283	76%	91%	64%
Africa	622	43%	68%	26%
North Africa	1	99%	100%	99%
Sub-Saharan Africa	**621**	**32%**	**59%**	**16%**
Developing Asia	620	83%	95%	74%
China	3	100%	100%	100%
India	304	75%	94%	67%
Latin America	23	95%	99%	82%
Middle East	18	92%	98%	78%
Transition economies & OECD	1	100%	100%	100%
WORLD	**1 285**	**82%**	**94%**	**68%**

Source: Figures from GEA (2012).

The Africa Energy Outlook 2014 states that –

> There is no single internationally accepted and internationally adopted definition of "modern energy access". Yet, significant commonality exists across definitions, including:
>
> - Household access to a minimum level of electricity.
> - Household access to safer and more sustainable (i.e. minimum harmful effects on health and the environment as possible) cooking and heating fuels and stoves.
> - Access to modern energy that enables productive economic activity, e.g. mechanical power for agriculture, textile and other industries.
> - Access to modern energy for public services, e.g. electricity for health facilities, schools and street lighting.[1]

1 IEA (2014:29).

People have energy access if they have access to at least:

- the equivalent of 35 kg of liquid petroleum gas for cooking per capita per year from liquid and/or gas fuels or from improved supply of solid fuel sources and improved (efficient, hygienic and non-polluting) cooking stoves; and
- 120 kWh of electricity per capita per year for lighting, access to most basic services (drinking water, communication, improved health services, improved education improved services, and others), as well as for added value to local production.

Any government with an interest in the welfare of its population should therefore make concerted efforts towards increasing access levels, reliability and affordability of supply, while taking note of environmental concerns to ensure sustainability. Quality of supply refers to technical availability, adequacy, reliability, convenience, safety and affordability of the energy relating to the people it is intended to serve.

Participation of sub-Saharan countries in the world economy remains marginal, and in general happens on terms not determined by the African nations themselves, but rather on terms determined by sympathetic nations, from America, Europe and Asia. The assistance offered by donor countries and organisations is often viewed with suspicion, because the sympathisers are, in many cases, the former colonisers of the African states they now assist. The benefits of such donor-recipient relationships have also been skewed towards the donor, with trickle benefits to the beneficiary. This has prompted the African nations to demand an upfront commitment in the form of 'local content' and 'local shareholding', including the building of local capacity to ensure continuity after the donor project has ended. Some donor communities have considered such demands as undermining their friendly offers, and as a result many projects have stalled. Where the donors have consented, and the local content has not been abused to mean politically connected locals, projects have progressed to fruition without any hitches, and many examples can be cited in this regard. Sadly, political power has been abused to the point that projects that could benefit the masses have stalled as a result of greed and lack of consideration.

On a per capita basis electricity demand in sub-Saharan Africa has remained largely unchanged for the last decade (at close to 400 kWh), with total consumption levels rising in step with the population. This is the lowest rate of per capita consumption of any major world region, 75% below that of developing Asia and less than the electricity needed to power one 50-watt light bulb continuously for a year. For comparison, electricity demand per capita in North Africa increased by more than 80% from 2000 to 2012, reaching 1 500 kWh.[2]

2 (ibid.:39).

Table 2: *Sub-Saharan Africa – Facts and figures in 2013–2015*

	Sub-Saharan Africa	Argentina	Namibia
Population	936,1 million	43,0 million	2,3 million[3]
Urban population	37%	92%	38%
Gross domestic product (USD)	1,613 trillion	0,537 trillion	13,11 billion
Gross domestic product per capita (USD)	1,657	12 509.53[4] (2014)	5 408.24 (2014)
Life expectancy at birth (years)[5]	56	71,73 m 79.07 w	60.35 m 61.62 w
CO_2 emissions (metric tons per capita)	0,8	4,47	1,39[6]
Electricity generation capacity (MW) (47 countries excluding South Africa)	30 000	32 870 (2010)	487[7] (2013)
Electricity consumption per capita (kWh/person per year)	141	2 967	213 (2011)
Electricity access rate (%)	25%	99,80% (2015)	47,3[8]

Source: Figure compiled by authors based on various sources as indicated.

The fact that more than 900 million persons in sub-Saharan Africa have access to an electricity generation capacity smaller than that in Argentina, which has less than 50 million persons, is depressing! What kind of development can be expected of a population with a 141 kWh annual per capita energy demand? Unless sub-Saharan African leaders take a radical step towards increasing the capacity to produce and provide electricity,

3 See http://www.indexmundi.com/namibia/life_expectancy_at_birth.html, last accessed 19 January 2016.
4 See https://energypedia.info/wiki/, last accessed 1 February 2016.
5 See the WHO's Global Health Observatory Data Repository available at http://apps.who.int/gho/data/node.main.688?lang=en, last accessed 17 February 2016.
6 See http://cotap.org/per-capita-carbon-co2-emissions-by-country/?gclid=CMO3vf-3sMoCFarpwgodBfYKXQ, last accessed 19 January 2016.
7 See http://www.indexmundi.com/namibia/electricity_installed_generating_capacity.html, last accessed 19 January 2016.
8 See http://data.worldbank.org/indicator/EG.ELC.ACCS.ZS, last accessed 19 January 2016.

and the capacity to utilise the provided electricity, the situation will remain the same, and sub-Saharan Africa will continue to be a net exporter of raw materials and labour, while being a net importer of finished products and services – a sure way to remain in perpetual poverty.

4 Energy Resources in Sub-Saharan Africa

Energy resources in sub-Saharan Africa as a whole are more than sufficient to meet regional needs, both now and into the foreseeable future. This holds true across the range of energy resources, with remaining recoverable resources of oil sufficient for around 100 years at the current level of production, coal for more than 400 years and gas for more than 600 years. Uranium is also present in large quantities in some countries and the region has a range of high-quality renewable resources, including solar, hydro, wind and geothermal. Many of these resources are spread unevenly across the huge expanse of continent and exploitation thereof is at differing stages of development. The solar radiation intensity is good, ranging from 1 600 to 2 400 kWh/m^2/year. Africa has good hydro potential, e.g. just the Grand Inga in the Democratic Republic of the Congo can produce up to 39 000 MW, which is more than the total installed capacity in sub-Saharan African countries, if South Africa is excluded. Wind energy potential is high on the west coast of southern Africa and eastern Africa.

A significant proportion of these resources are, as yet, undeveloped (particularly non-hydro renewables). In fact, many of the known resources are not yet fully surveyed or understood, and there remains good reason to believe that sub-Saharan Africa's energy resources will increase as exploration and assessment continue. The opportunity is present to develop a modern energy sector across Africa that draws on these varied resources; but the path from theoretical potential to harnessed supply is likely to be long and complicated.

5 Renewable Energy Market Conditions

Current utilisation of renewable energy resources is for off-grid solutions (solar home systems, micro- and mini-grids) since they are the most appropriate and cheapest option for rural areas. Of late, quite a significant portion of grid electricity is generated from intermittent renewable energy resources, such as solar photovoltaics, concentrated solar power and wind. Infrastructure is poor (weak and poor networked electricity grid and poor road networks). In most countries base load power is limited. There is general lack of verified resource potential information (e.g. for wind energy).

There is a general absence of appropriate policy and regulatory regimes that support renewable energy. Countries such as Ghana, Kenya, South Africa, Uganda, etc. have developed various policy instruments (tendering, feed-in tariffs) to support renewable energy. Namibia and others are still formulating appropriate instruments. There is still the need to invest seriously in improving access if sub-Saharan Africa is to participate meaningfully in the world economy.

6 Challenges

There is no doubt that electricity is a major ingredient for economic growth. The principal technical challenge is to design systems that are affordable and also sustainable over the long term in settings where capital and operating budgets are often small and infrastructure for operation and maintenance may be minimal. The technology employed must be appropriate for the social, economic and environmental conditions of the settlement.

At regional and national level, the key technical principles of concern to policy makers and regulators are compliance with renewable energy targets and localisation of technology. At project level, the standard principles that require mini-grids should comply with safety, reliability, security, environmental and social impact, flexibility and economy. Many mini-grids will be interconnected to the main grid and they must therefore be designed to accommodate this eventuality. There must be a seamless transition between islanded and parallel operation. Technology choice must be driven by the market, and not be determined elsewhere, as is the case in many developmental projects.

7 Market Needs and Demand for Mini-grids

7.1 International Goals

In May 2013, the SADC energy ministers directed the SADC Secretariat to ensure that the Regional Energy Access Strategy and Action Plan (REASAP) was aligned to the United Nations Sustainable Energy for All (SE4ALL) initiative that aims to achieve the following objectives by 2030:

- universal access to modern energy services;
- doubling the rate of improvement in energy efficiency; and
- doubling the share of renewable energy in the global energy mix.

Universal access for all end users by 2030 is envisaged.

7.2 Public-private Partnership

Mini-grids will be financed, developed, operated and maintained by public-, private- and community-owned enterprises or a hybrid or combination of such enterprises. The bulk of project funding is expected to be provided by communities and the private sector. The focus of public sector funding will be to create the enabling environment that attracts private sector funding. However, technology choice must be driven by the market, and enabling policies for public-private partnerships are still needed.

8 SADC Regional Goals on Energy Access

SADC has defined mini-grids using renewable and hybrid generation as an important contribution towards the region's strategy to increase access in an environmentally and economically sustainable way. The REASAP, adopted by the SADC energy ministers in 2010, specifies the following goals:[9]

- strategic goal – to “harness regional energy resources to ensure, through national and regional action, that all people of the SADC Region have access to adequate, reliable, least-cost, environmentally sustainable energy services”; and
- operational goal – to “endeavour to halve the proportion of people without energy access within 10 years for each end use and halve again in successive 5 year periods until there is universal access for all end users”.

Universal access for all end users was envisaged, but, five years later, not much has been achieved in this regard.

Outcomes of commissioned studies suggest that the instruments needed for mini-grid development include:

- standardised licensing procedures and licence templates;
- guidelines for use of energy funds for mini-grid investment support (‘subsidy guidelines’);
- procurement guidelines for competitive bidding;
- standardised concession agreement (SCA);
- standardised operation and maintenance agreement (SOMA);
- standardised tariff methodology (STM); and
- standardised power purchase agreement (SPPA).

The instruments are oriented to facilitating the establishment of efficient mini-grids on a viable, sustainable basis. One of the main themes is that mini-grid customers need electricity much more than they need low tariffs. Regulation should therefore be as light-handed as possible, e.g. tariffs for mini-grids, in particular, should not be directly regulated. However, enabling policies for public- private partnerships are still needed.

9 SADC Regional Electricity Regulators Association

The SADC Regional Electricity Regulators Association (RERA) is a formal association of independent electricity regulators whose establishment was approved by the Southern African Development Community (SADC) ministers responsible for energy in Maseru, Lesotho, on 12 July 2002. The Association was officially launched in Windhoek, Namibia, on 26 September 2002, and it provides a platform for effective cooperation between independent electricity regulators within the SADC region. RERA has commissioned a number of studies into micro-grids for southern Africa.[10]

9 SADC Regional Energy Access Strategy and Action Plan (2010).

10 See *https://energypedia.info/images/9/92/SADC_RERA_Zimbabwe_Case_Study.pdf*, last accessed 5 February 2016.

10 Where Do We Go?

Five actions are essential to transforming the energy situation in sub-Saharan Africa:

- Sub-Saharan states need to adopt a clear and consistent statement that modern energy access is a political priority and that policies and funding will be reoriented accordingly. National governments need to adopt a specific energy access target, allocate funds to its achievement, and define their strategy for delivering it.
- They should mobilise additional investment in universal energy access, above USD14 billion per year. All sources and forms of investment have their part to play, reflecting the varying risks and returns of particular solutions.
- All sectors of the economy need to grow, but private sector investment needs to grow most of all. For this to happen, significant barriers must first be overcome. National governments need to adopt strong governance and regulatory frameworks, and invest in internal capacity building. The public sector, including multilateral and bilateral institutions, needs to use its tools to leverage greater private sector investment where the commercial case is marginal and encourage the development of replicable business models. When used, public subsidies must be well-targeted to reach the poorest.
- There is a need to concentrate a substantial part of multilateral and bilateral direct funding on those difficult areas of access which do not initially offer an adequate commercial return. Provision of end-user finance is required to overcome the barrier of the initial capital cost of gaining access to modern energy services. Operating through local banks and microfinance, arrangements can support the creation of local networks and the necessary capacity in energy sector activity.
- Sub-Saharan states should make provision for the collection of robust, regular and comprehensive data to quantify the outstanding obstacles and monitor progress towards their elimination.

11 Way Forward

There are great disparities in the different African regions caused by the still unbalanced development of the energy production and transmission infrastructures on the continent. According to the African Development Bank (AfDB), over 600 million people in Africa do not have access to electricity and over 700 million rely predominantly on solid fuels for cooking. Given the significant energy deficit, a financing gap of an estimated USD 55 billion per year must be bridged in order to provide access to affordable modern energy across the continent. The Africa Renewable Energy Initiative which aims to catalyse 10 GW of new renewable energy generation capacity by 2020 and at least 300 GW by 2030 is one example of how the New Deal will drive change in the energy sector.[11] Private sector financing is required, and the role of the public sector cannot be underestimated since market risks are still high. Public-private partnerships are ideal for some projects, especially where risks are still high. Sub-Saharan African countries need to get market fundamentals right in order to attract and retain the requisite investment in the energy sector. Some of these are:

- to create a level playing field for independent power producers;
- to implement energy market reforms to provide easy market access; and
- to mitigate political and regulatory investment risk with long-term stable policy frameworks to match developmental goals; and
- to integrate partnerships into sector development plans.

The establishment of the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE) can be considered as a promising step towards more energy security in the region. The SADC Energy Ministers Meeting that took place in Johannesburg, South Africa, on 24 July 2015 endorsed the establishment of SACREEE[12] and Namibia was selected as host country. The selection of Namibia testifies to its enabling conducive environment, which will ensure that the SACREEE exercises its functions and fulfils its objectives in an efficient and effective manner. The SACREEE provides a ray of hope to the millions of SADC inhabitants who still lack access to adequate modern energy services.

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11 See http://www.afdb.org/en/news-and-events/article/afdb-to-support-electricity-access-for-all-by-2030-with-african-renewable-energy-initiative-15119/, last accessed 5 February 2016.

12 See http://www.gov.za/speeches/34th-meeting-sadc-energy-ministers-24-jul-2015-0000, last accessed 19 January 2016.

3.
CHALLENGES AND OPPORTUNITIES FOR INCREASED ENERGY ACCESS IN SUB-SAHARAN AFRICA, WITH SPECIAL REFERENCE TO NAMIBIA

Zivayi Chiguvare & Helvi Ileka

1 Introduction

Namibia imports 100% of its oil and gas requirements, and more than 60% of its electricity demand. This electricity demand satisfies only about 44% of the population living mainly in the urban centres. Namibia is endowed with abundant sunshine, and other natural energy resources like wind and biomass. Even the Benguela currents in the Atlantic Ocean provide excellent opportunities to harness the kinetic energy of the water and convert it into electricity. Proven gas reserves off the Atlantic coast could generate up to 800 MW of electricity for at least 15 years, yet the majority of the Namibian population continues to rely on natural flows of energy and has no access to modern energy supply in the form of electricity. Many therefore rely on traditional sources of energy such as direct sunshine and firewood. Alternative energy opportunities exist, however, and Namibia could become the example of a country using 100% electrification in sub-Saharan Africa.

Lack of access to modern energy systems slows down the development of any country, and its participation in the modern economy remains marginal. The country would continue to rely on importation of goods manufactured elsewhere, and on selling its resources as raw materials without any meaningful value addition. This is not a sustainable way forward and in the long run may cause a collapse of the economy. Any serious government will work hard to provide modern energy technologies to its population, and add value to its raw materials in order to benefit the local citizenry. Sometimes the decision to supply electricity to all is not based on the economics of the day, but is rather politically based, with the hope that economic benefits will accrue in the long run.

Increasing energy access rates has the potential to lift people out of energy poverty, thus creating dignified living conditions and expanding economic opportunity. Energy poverty undermines economic development, fuelling political instability and the creation of failed states. Indeed, there is a strong correlation between political stability and electrification rates.[1]

1 Banks (2013).

2 Access to Energy in Africa

Energy in Africa is a scarcer commodity than in the developed world. Fifteen per cent of the world's population lives on the African continent, yet they represent only 3% of global electricity consumption. Annual per capita consumption is 518 KWh in sub-Saharan Africa, the same amount of electricity used by an individual in an Organization for Economic Cooperation and Development (OECD – example is the US) country in 25 days.[2] Across the African continent only 10% of individuals have access to an electrical grid and, of those, 75% come from the richest two quintiles in overall income.[3] Less than 2% of the rural populations of Malawi, Ethiopia, Niger, and Chad have access to electrical power. Electrical provisioning in Africa has generally only reached the wealthy, urban, middle class and commercial sectors, bypassing the region's large rural populations and urban poor.[3] According to the Forum of Energy Ministers in Africa (FEMA), most agriculture still relies primarily on human beings and animals for energy input.[4]

There is a chronic electricity supply shortage across Africa. The 48 sub-Saharan countries have a combined installed generation base of only 68 GW, according to the African Development Bank Group.[5] This is roughly equal to the generation capacity of Spain, a country whose population is less than 5% of that of sub-Saharan Africa. However, the electricity shortage across sub-Saharan Africa is far from uniform. South Africa has 40 000 MW of power and 50 million people (3,63 MWh per capita). In contrast the rest of sub-Saharan Africa has roughly 25 000 MW of electricity capacity and over 800 million people (0,33 MWh per capita). In contrast, the German economy is large and developed, ranking fourth in the world by GDP. Because of this, Germany ranked sixth in global energy consumption between 2004 and 2007.[6] Indeed, Germany was Europe's largest consumer of electricity in 2002: electricity consumption that year totalled 512,9 terawatt-hours. In 2013 Germany's electricity production reached 631,4 TWh.[7] In 2012 the German population was 81,8 million and energy generation was 579 TWh of electricity (5,59 MWh per capita).

Despite many positive efforts, more than 620 million people (two-thirds of the population) in sub-Saharan Africa are without access to electricity. For those that do have electricity access in sub-Saharan Africa, average residential electricity consumption per capita is equivalent to less than half the average level in China or one-fifth of that in Europe.[8] The

2 Cook (1976).

3 The World Bank (2005).

4 FEMA (2006).

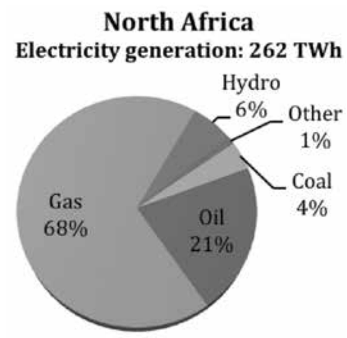
5 Standard Bank (2013).

6 According to the International Energy Statistics of the US Energy Information Administration, see http://web.archive.org/web/20100108233218/http:/tonto.eia.doe.gov/cfapps/ipdbproject/IEDIndex3.cfm?tid=44&pid=44&aid=2, accessed 8 January 2013.

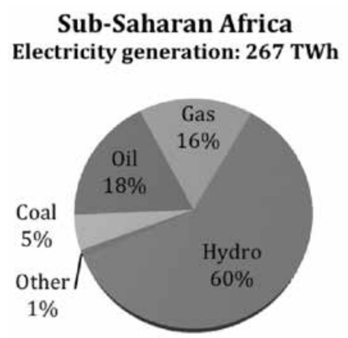
7 See http://www.ag-energiebilanzen.de/index.php?article_id=29&fileName=20140207_brd_stromerzeugung1990-2013.pdf, last accessed 23 January 2015.

8 IEA (2014).

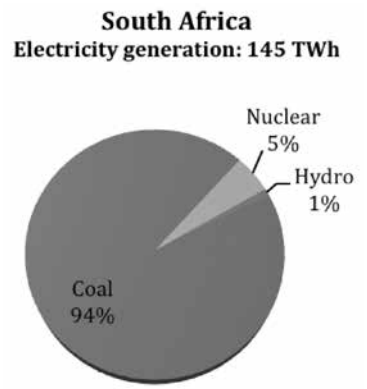
lack of resources, as well as non-existent infrastructure, means that public and private organisations must now unite to empower Africa and to consolidate development efforts, in this respect.



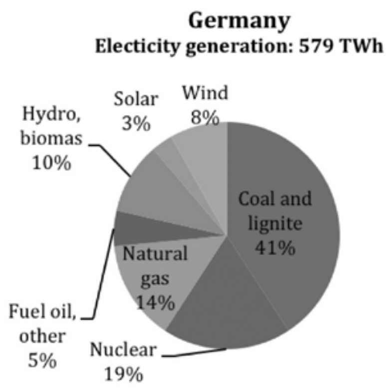
Total population – 165 million
Energy per capita = 1,56 MWh



Total population – 807 million
Energy per capita = 0,33 MWh



Total population – 50 million
Energy per capita = 3,63 MWh



Total population – 80 million
Energy per capita = 5,59 MWh

Figure 1: Comparison of Electricity Generation Energy Mix and Capacities in Africa and Germany, 2011

Source: Author's figures based on data from the International Energy Agency, the World Bank and the World Health Organization.

According to the IEA, approximately 40% of the new electricity provision required for universal access over the next 15 years is likely through grid extension. The remaining 60% is the natural domain of small and medium enterprises which use distributed, renewable technologies.[9] It is interesting to note that significant new discoveries have prompted the IEA to anoint sub-Saharan Africa as the "new frontier" in global oil and gas.[10] Countries such as Cameroon, Ghana, Equatorial Guinea, the Republic of Congo, Kenya, Tanzania and Uganda are emerging as potentially major new producers of oil. There have also been discoveries of large offshore natural gas resources in Mozambique and Tanzania, prompting plans to develop East Africa into a major exporter of liquefied natural gas. South Africa is estimated to have significant shale gas resources as well.

3 Access to Energy in Namibia

Namibia's energy sector consists of petroleum product imports, local fuelwood supplies, and local and imported electricity. Namibia currently has no indigenous supply of either oil or gas, and there is no refinery, so all petroleum products are imported, ready to use. Liquid fuels, which are all imported, account for over 63% of net energy consumed in Namibia. Namibia's GDP for 2010 was approximately US$5 202 per capita.[11] The average annual GDP growth rate for the past 20 years was approximately 4,1%.

The overall population density in Namibia is low, at 2,6 persons per square kilometre, with a variation of 0,5 in the Karas Region to 22,9 in the Ohangwena Region (Census, 2011); compared with the average population density in other sub-Saharan African countries of 36,1 persons per square kilometre in 2010. This presents a challenge for grid extension over long distances to service a very small population with a comparatively insignificant electrical load. The total population enumerated in Namibia during the 2011 Census was 2 113 077, of which 903 434 people were in urban and another 1 209 643 people in rural areas, constituting 57% rural, and 43% urban. It is estimated that 70% in the urban areas, equalling 632 404 persons, and about 25% in rural areas, equalling 302 411 persons, have access to electricity. Altogether, therefore, the population with access to electricity is about 44%.

4 Energy Policy Position

The government of the Republic of Namibia has a mission to ensure an adequate and affordable energy supply in a sustainable manner, taking advantage of Namibia's natural resources in support of the nation's socioeconomic development. The White Paper on Energy Policy of 1998 indicates seven objectives: *Security of supply* – Namibia will secure a sufficient and reliable supply of sustainable energy support to the growing needs and the government's endeavour to develop new industry. *Social upliftment* – Namibia will redress inequalities in the provision of energy supplies, and ensure that all households have access to affordable and appropriate energy supplies. *Economic competitiveness / Economic efficiency* – Namibia will ensure that increases of energy

9 See http://www.gvepinternational.org/en/business/our-approach?gclid=CK7g8KqK9cICFcjHtAodinsAZA, last accessed 23 January 2015.

10 IEA (2010:240).

11 The World Bank Group & Electricity Control Board of Namibia (2011).

supply and utilisation are sustainable, competitive and economically efficient. *Effective energy sector governance* – Namibia will effectively govern the energy sector, which will include effective planning, flexibility in approach, and adequate staff resources. *Investment and growth* – Namibia will endeavour to achieve a high level of investor confidence in the energy sector, which will result in fixed inward investment and economic benefits for the country. *Sustainability* – Namibia will move towards the sustainable use of natural resources for energy production and consumption as far as economically possible. The White Paper on Energy Policy recognises that Namibia has a range of renewable energy resources at its disposal from which electricity can be generated, but does not set targets for their desired contribution to the domestic generation mix going forward.[12] Much has happened in Namibia regarding the inclusion of renewable energy technologies, which suggests that the 1998 policy document may need to be revised since it is now more than 16 years old.

The Namibian Electricity Supply Industry (ESI) is regulated by the Electricity Control Board (ECB), subject to the powers vested in the regulator under the Electricity Act 2007. Under the Act, any person engaged in the generation, transmission, distribution, supply, import or export of electricity must obtain a licence from the ECB for such operations. Individual licences are required for each of these activities. There are well-defined processes for such licence applications and the general licence conditions have been developed by the ECB and are generally well understood.

12 *GIZ* (2013).

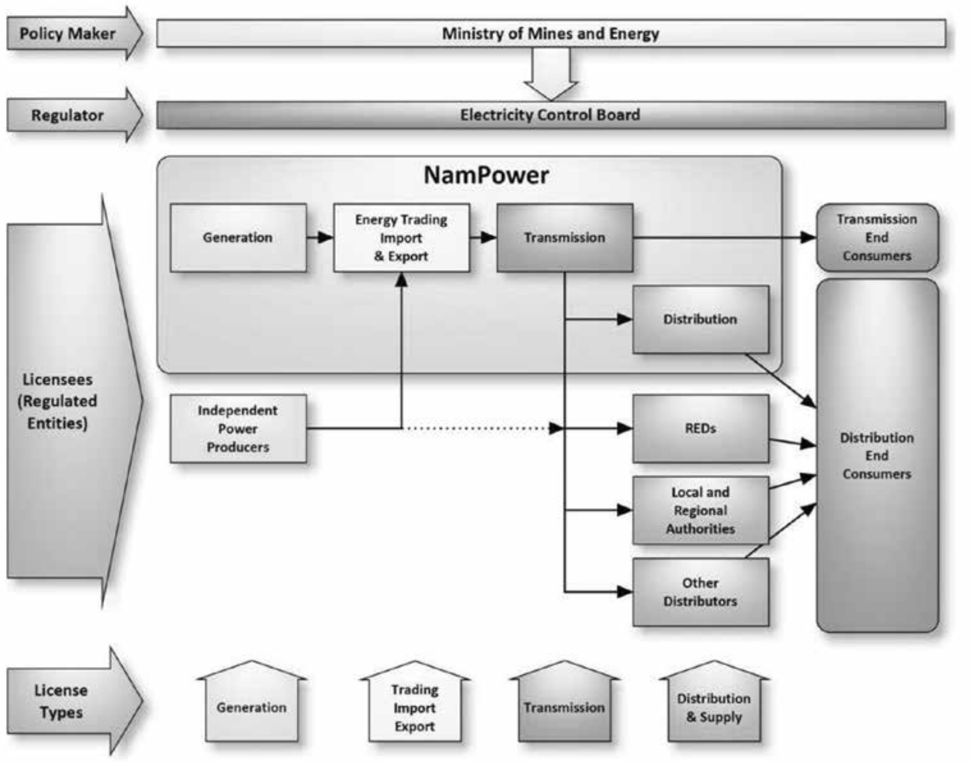


Figure 2: Electricity Supply Industry in Namibia
Source: The World Bank Group & Electricity Control Board of Namibia National Integrated Resource Plan (2013:2-2).

The main licensees in Namibia are NamPower, the Regional Electricity Distributors (REDs), and local and regional authorities. The electricity industry is dominated by the state-owned vertically integrated power utility company, NamPower, which owns and operates all of the country's generation and transmission assets, as well as some distribution facilities in the rural areas of central and southern Namibia. Vertically integrated organisations, in general, result in monopolistic situations where the transmission, generation and trading sectors are governed by the state utility. The bulk of the distribution of electricity is undertaken by the City of Windhoek (the country's largest distributor). The remainder is managed by three regional electricity distribution companies (REDs) – the Northern RED (NORED); the Central and Northern RED (CENORED), which covers most of the central to northern parts of the country stretching to the Caprivi Strip; and the Erongo RED, which covers the central coastal region to the west of the country including Walvis Bay and Swakopmund – and by numerous small municipal distribution operations.

Conditional licenses have been issued to nine Independent Power Producers (IPPs) related to proposed power plants based on wind, solar, biomass, water and coal. NamPower encompasses three main ring-fenced businesses, namely generation, trading and transmission. There is currently also a distribution component within transmission, but NamPower is gradually pulling out of direct distribution. NamPower, in its role as system operator and trader, currently has the important role of balancing supply and demand, and it is the contracting party for imports, primarily from Zimbabwe Electricity Supply Authority (ZESA) in the Republic of Zimbabwe and Eskom in the Republic of South Africa, and also from the Zambian Electricity Supply Company. As such, NamPower seeks optimally to balance its own generation with imports and thereby obtain the best possible cost scenario. In essence, NamPower is responsible, as the single buyer, to buy electricity outside Namibia and sell it inside the country.

A full range of power-generation technologies that could be of interest in Namibia were identified, as well as parameters, such as capital cost, operating cost, production capability and grid-connection costs, was estimated for each technology.[13] The recommended National Integrated Resource Plan (NIRP) will require a significant increase in investment in new generation and transmission assets to meet the country's increased power demands resulting from economic growth. The planned approach will reduce power imports primarily through development of the 800-MW Kudu Gas Power Plant operating on Namibia's offshore natural gas reserves, as well as increased use of renewable power by developing solar photovoltaic (PV), concentrated solar power (CSP) and wind-power plants. Taking advantage of the fact that Namibia has one of the best solar radiation regimes in the world, the government is enabling the development of solar photovoltaic power generation technologies through a special purpose vehicle, the Project Steering Committee (PSC), established to facilitate procurement of 30 MW through a competitive bidding process. The adopted procurement mechanisms take care of all other renewable energy technologies. The demand-side management programme, complemented by the envisaged measurement and verification protocols and guidelines, is expected to improve energy efficiency.

5 Energy Supply Options in Namibia

The main internal sources of electrical power for Namibia are the hydroelectric scheme at Ruacana (332 MW), the coal-fuelled Van Eck power station in Windhoek (120 MW), and diesel-powered generators at Paratus (24 MW) and Anixas (22.5 MW) in Walvis Bay (46,5 MW), as indicated in Table 1. The total installed capacity is about 507,5 MW, but the actual output currently is only about 27% owing to various technical and natural challenges, such as the ageing of the Van Eck power plant, the low water flow in the Kunene River due to poor rainfall, among others.

13 The World Bank Group & Electricity Control Board of Namibia (2012).

Table 1: *Electricity generation plants in Namibia*

	Power plant and location	Generation capacity	Year commissioned	Remarks on effective availability
1	Ruacana Hydropower Station Kunene River, in the north of Namibia, where the river becomes the border between Namibia and Angola	332 MW Three 80 MW hydro generators for a total of 240 MW 4th unit – 90 MW	1978 2012	• Water from the Kunene River is regulated by a series of dams in Angola, primarily the Gove Dam on the Angolan highlands, approximately 1 000 km northeast of Ruacana, and a diversion weir at Calueque, to channel part of the flow to a surge head bay on top of the mountain – **limited reliability**.
2	Van Eck Coal Power Plant Outskirts of Windhoek	120 MW Using four 30-MW generators	1973	• Coal used is imported from South Africa, transported by ship to Walvis Bay and then by rail or road to Windhoek – **makes it expensive**. • Plant is usually operated as a standby and peaking power station. • Very limited emission control equipment and thus emits high levels of air pollutants. Hence station is limited to burning 3 500 tonnes of coal each week, although it may use emergency stockpiles if necessary. • The maximum output the plant can reach is only some 50 MW owing to various constraints.

3	Paratus Diesel Power Station Walvis Bay	24 MW Using four 6-MW (nominal) diesel generators	1976	• Maximum output is currently in the order of 17 MW. • Used mainly as a standby and peaking power station, but it is also contractually bound as an emergency standby plant for the city of Walvis Bay. • Uses light fuel oil (LFO) to start-up and shut down, switching to heavy fuel oil (HFO) once a unit is generating more than 2,7 MW.
4	Anixas Power Station Located near the Paratus Diesel Power Station in Walvis Bay	22,5 MW Using 3 x 7,45 MW Caterpillar V16 cylinder diesel generator sets	2011	• New and proven technology which has a higher efficiency and reliability, fewer emissions and less noise than older power stations of its type.

Currently, NamPower meets the national demand for electricity by generating at Ruacana hydropower plant, and importing from Zimbabwe Electricity Supply Authority (ZESA), Zambia Electricity Supply Corporation Limited (ZESCO), Electricity Supply commission (Eskom) of South Africa, and Aggreko power company of Mozambique (see Figure 3). Namibia relies heavily on imports of electricity ranging from 40% to 80%, depending on the available internal generating capacity subject to seasonal variability of climatic and hydrological conditions and other factors. Demand for electricity has grown steadily in Namibia, showing a 150% increase over the past 22 years.[14] The country's maximum (peak) demand stood at about 534 MW in 2013, and was estimated to grow by 4% annually.[15] This implies that by the end of 2014, peak demand would have been 555 MW. During dry seasons the Kunene River is low in water flow and the Ruacana hydropower plant cannot be operated at full load. This scenario has rendered the country's electricity supply situation critical as the future of its electricity supply is almost entirely at the mercy of external policy and decision makers. Between 2014 and 2031 peak demand is projected to rise from about 550 MW to 1 100 MW, while the annual energy demand is expected to rise from 3,5 TWh (1,67 MWh per capita) to 7,5 TWh (about 2,5 MWh per capita). The power supply situation in Namibia is expected to remain critical until perhaps the planned Kudu Gas Power Plant comes on stream in 2018.

14 NamPower (2014).
15 NamPower (2013).

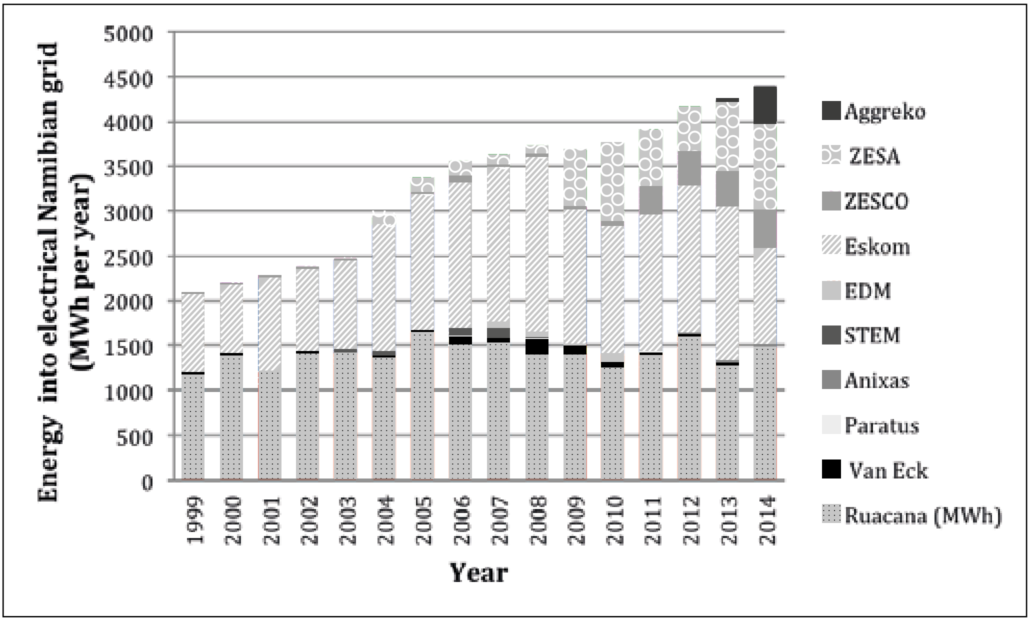


Figure 3: Historical energy demand showing proportional contributions of local and imported sources (year 1999 is interpreted as July 1998 to June 1999)
Source: Author's figure based on data from NamPower Annual Reports 2000–2014.

The transmission system and the trading of electricity are both fully managed by NamPower, which is the single buyer in Namibia. The generating branch of the power utility is not yet unbundled; it encompasses all the existing power plants feeding the grid to date (see Table 1). Any independent power producer (IPP) that wants to feed electricity into the grid has to sell it to NamPower through a power purchase agreement (PPA).

Importation of power from South Africa is carried along two high-voltage lines of 400 kV and 300 kV with capacities of 500 MW and 200 MW, respectively. The national electricity grid of 15 500 km of transmission lines serves to distribute power from several primary sources of electricity. High-voltage lines deliver power via a network of lines of successively lower and lower voltages the closer they come to the final consumers of electricity. Substations along the grid distribute and transform the power from higher to lower voltages.

The grid is a major technical limitation for the integration of renewable energy in Namibia. The overall structure does not permit an important balancing of power. Some transmission lines present significant losses, which are even bigger in the distribution system (up to 20%). Moreover, many substations need to be upgraded in order to evacuate additional power. The interconnection with other Southern Africa Power Pool (SAPP) members is still limited, but the situation is improving. For instance, a high voltage DC line (400 kV – 600 MW) that connects Namibia, Botswana and Zambia was commissioned in 2010. In addition, Namibia is also connected to Angola with AC lines.

In addition to the electricity grid, many rural homesteads, schools, clinics, tourist resorts and other small settlements use the so-called off-grid sources of power. Most of these are diesel, solar power and other generators that produce relatively small amounts of electricity. Cumulatively to date, Namibia has about 3,74 MWp solar power installed (solar water heaters - SWH, photovoltaic water pumping - PVP, solar home systems, SHS and solar cookers).[16]

6 Opportunities Presented by Renewable Energy

6.1 Solar

Namibia has one of the best solar regimes in the world with an average high direct insolation of 2 200 kWh/m^2/a, and minimal cloud cover. The principal climatic indicator determining the technical potential for solar PV is the global horizontal irradiance (GHI). The areas with the highest GHI are mostly located in the western parts of Namibia, from north to south. The Ministry of Mines and Energy (MME), has well-defined grid and off-grid electrification master plans: the Regional Electricity Distribution Master Plan (REDMP) for electrification through grid extension, and the Off-Grid Energisation Master Plan (OGEMP) for electrification of areas not covered by REDMP. Through these two masterplans, the Government has been able to identify areas that are off-grid as well as those where the grid will not be expected to reach in the next 20 years. In such areas government is providing stand-alone renewable energy technologies and mini grids. OGEMP's objective is to provide access to appropriate energy technologies to rural areas. The Solar Revolving Fund loan scheme administered by Ministry of Mines and Energy finances individuals wishing to install applications such as solar water pumps, solar photovoltaic home systems, solar water heaters, and solar cookers/ stoves. Access to renewable energy technologies is also improved by the establishment of Energy Shops. Fourteen Energy Shops are located in different regions and their primary function is to stock and sell suitable and approved energy products and compatible appliances. Public institutions such as clinics, schools and police base stations falling under the domain of OGEMP are electrified by government with 288kWp containerized stand- alone systems and large decentralised hybrid systems.

One of the major solar PV applications in Namibia is solar water pumping (PVP) on cattle farms. Solar PV is also useful for rural access to modern energy. It consists of small systems equipped with an inverter and a storage system (batteries) that provide enough electricity for lighting, radio, TV and fans. Larger solar home systems are utilised by households having substantial levels of consumption. They can even feed the grid without a license if the system is smaller than 500 kVA. However, there is no compensation from the power utility yet.

The number of large PV plants both off- and on-grid is increasing in Namibia. Recently the National Breweries inaugurated a 1.1 MW grid-connected rooftop PV system

16 Heita (undated).

capable of supplying 34% of its electricity demand, thus demonstrating the possibility of reducing dependence from the main grid. NamPower itself inaugurated a 640 kW system, also grid-connected, indicating the availability of expertise in such systems. There is however no legislation that allows the private owner of a grid-connected system to be paid for extra power injected into the grid. Net metering rules whose development is spearheaded by the Electricity Control Board are now at an advanced stage.

6.2 Wind

It is radiation from the sun that provides heat energy which warms the atmosphere; and high levels of radiation and, thus, heating of the air and ground surface are largely responsible for the great rates of water evaporation in Namibia. Solar radiation also drives the general circulation of the atmosphere and wind, since air that has been heated rises and creates a relative vacuum of lower pressure. Winds are thus generated as air flows from areas of high pressure to replace the rising air.

Wind is a dominating feature of the coastal climate because of the presence of the South Atlantic Anticyclone off the coast. The Anticyclone operates like a gigantic fan, producing strong winds that drive the Benguela Current northwards and carry sand from the shore onto the vast expanse of Namib dunes. These winds also cause upwelling cells on the coast, which bring nutrient-rich water to the surface, thus producing Namibia's wealth of fish resources. Wind is, however, less prevalent inland.

Wind energy can be converted into electricity, and initiatives to do this are being pursued near Lüderitz. A wind assessment project was carried out by the Ministry of Mines and Energy (MME) and German Technical Cooperation (GTZ) in 1996 for the region of Lüderitz and Walvis Bay on the southern coast of Namibia. It showed that both sites have the potential for producing wind power with wind speeds around 7 m/s. The methodology included a model analysis (WAsP and WindPro Programme), as well as ground measurement (10 m). Recent measurements at 85,7 metres high, undertaken in Lüderitz by a potential wind IPP, predict a yearly wind speed average reaching 10 m/s with a stable wind direction. Additional potential sites with a good wind regime are likely to exist in areas located more in the North (e.g. Henties Bay, Terrace Bay, Mowe Bay). The SAPP has estimated the Namibian potential for wind at 27.201 MW and 36 TWh per year. There is currently one wind turbine (220 kW) installed in Namibia, which feeds the distribution grid in Erongo Region.

6.3 Biomass and Biogas

In Namibia, immense land areas are infested with invader bush. It is an important environmental concern because the bush encroachment limits the local biodiversity, the water absorption of the soil, and the livestock carrying capacity. It has been calculated that 26 million hectares of land are invaded in Namibia. Most of this resource is located in the north of the country. If this amount of bush were used to produce electricity, the same calculations show that the potential generation would be 1 100 TWh, which at the Namibian usage scale can be considered as unlimited.

From 2007 to 2010, the project Combating Bush Encroachment for Namibia's Development (CBEND), funded by the European Union to the amount of N$14 million, established the first bush-to-electricity demonstration plant (250 kW) in Namibia. It was also the first PPA signed by NamPower with an IPP. However, the power plant does not feed electricity to the grid yet, owing to the low power factor of the connecting line.

6.4 Hydro

Namibia's only perennial rivers are the Kunene, Kavango (forming borders with Angola and Zambia in the north) and the Orange River (bordering South Africa in the south). In 2010, 64% of the electricity was generated at the Ruacana hydropower plant. Ruacana hydropower plant now has a capacity of 332 MW.

NamPower is examining the possibility of installing a second hydropower plant on the Kunene River, downstream from Ruacana. The Baynes hydro project, has been in the pipeline for many decades. However, political tensions with Angola, as well as socio-environmental concerns, have restricted the project to a feasibility study. Recently, the perspective of supplying southern Africa from a large hydropower plant has raised the interest of both Namibia and Angola. The estimated project implementation cost is about US$1,3 billion (about N$14 billion). The deployment of small hydropower plants (6 to 12 MW) along the Orange River for a total capacity of 70 MW is also being examined by NamPower. The estimated cost is up to U$35 million and the plan is to develop the project as a clean development mechanism activity.

Both off-grid and grid-connected energy production from renewable energy resources require a special institutional and legal framework, which is, unfortunately, not yet in place. An overwhelming need exists to transform Namibia's energy regulatory and institutional framework because the current one is not as effective as the need of the country dictates. Off-grid electricity supply is not catered for in the Electricity Act, 2000, nor do the proposed licences take off-grid electricity supply into account. Off-grid electricity supply is primarily a distribution function, and *not* a generation function, although small-scale generation is involved (much less than the 500 KVA envisaged by the Electricity Act, 2000).

7 Challenges and Opportunities

A goal set by the White Paper on Energy Policy "that 100% of the peak demand and at least 75% of the electric energy demand" should be supplied from internal sources by 2010 has not yet been achieved. Since gaining independence in 1990 Namibia has added little to its generation asset base, the bulk of which was built in the 1970s.

Table 2: *Challenges and Opportunities*

	Challenge	Opportunity
1	Inherent challenges for the country's power sector include long distances between population centres, rugged terrain, a long Atlantic coastline and a very dry climate. Sometimes the losses incurred could be more than the energy demand of the end beneficiary population. In other words, it does not make economic sense to extend the main utility grid to every individual in Namibia. Such decisions must be political and targeted to populations whose load profile can be quickly increased.	The Namibian set-up presents huge opportunities for decentralised electricity supply through isolated home systems or mini-grids using the various energy streams abundant at specific sites. However when electrification is done in this format, the load profiles should not be too limited because the beneficiary populations then tend to regard renewable energy off-grid solutions as an inferior power supply when compared to the main grid. We argue that when properly designed, off-grid PV power solutions can be competitive economically.
2	The high upfront capital cost of many resources, particularly renewable resources, is one of the most critical barriers to the development of an energy market.	Current utilisation of renewable energy resources for off-grid solutions is the most appropriate and cheapest option for some rural areas of Namibia. The opportunity is to design off-grid systems, with possibilities for future on-grid integration.
3	Addressing the lack of food security and limited water resources takes priority over energy initiatives, for these factors are necessary for life.[1]	In Namibia, the water, in general, is underground, and has to be pumped to the surface. In many instances, water pumping can be done effectively by using either windmills or PV water pumps. The solar resource is available in sufficient quantity almost everywhere in Namibia.

4	There is general lack of verified resource potential information (e.g. for wind energy). There is a general absence of appropriate policy and regulatory regimes that support renewable energy. Countries such as Ghana, Kenya, South Africa, Uganda, and others have developed various policy instruments (tendering, feed-in tariffs, etc.) to support renewable energy.	The Namibia Energy Institute currently conducts resource assessment studies to verify potential. The opportunity to learn from experiences of other countries should not be underestimated. Namibia and others are still formulating appropriate instruments. Namibian Policy requires urgent review to capture current trends and developments in the energy sector. For example the carbon market and the various instruments used in the procurement of renewable energy such as feed-in tariffs need to be incorporated in the energy policy. The planning tool such an integrated resource plan a national integrated resource plan (NIRP) which is an implementation plan for national energy policy that combines energy supply options and energy efficiency measures including demand side management (DSM) to provide energy services at a minimum cost, with environmental and social costs also needs to be incorporated in the national Energy Policy as a matter of urgency, for coherency in planning and resource allocation, increasing efficiency in resource allocation and prioritisation, as well easy and quick decision making for both investor and regulator for business proposals and projects that are in line with national interests.
5	Grid supply is insufficient, unreliable or inaccessible. Renewables-based capacity is growing rapidly but from a very low base (with the exception of hydropower).	Large-scale private ownership of oil-fuelled generators and greater focus on developing mini and off-grid power systems should be encouraged.
6	Sub-Saharan Africa is rich in energy resources. Huge renewable resources remain untapped. There is excellent solar energy potential across all of Africa and good hydropower potential in many countries; while wind power potential occurs mainly in coastal areas and geothermal energy sourcing possibilities are plentiful in the East African Rift Valley. In the last five years, nearly 30% of world oil and gas discoveries were made in sub-Saharan Africa; but the challenge to turn these discoveries into production and the resulting revenue into public benefits is formidable.	This is the region's opportunity to shine, to learn from past experiences, to take intelligent decisions and to do something that really benefits the local citizenry. Value addition that includes the construction of state-of-the-art refineries should be explored without hesitation. The region could change from net importer to net exporter of finished petroleum products. Proceeds can then be used to avail energy access to all. This is the opportunity to carefully map out and define mutual benefits while working within public-private partnerships – both nationally and internationally.

7	Oil resources are being developed, with production of 5,7 mb/d of crude oil in 2013, primarily in Nigeria and Angola. The region exported more than 5 mb/d of crude, and imported around 1 mb/d of oil products. Natural gas use of 27 bcm in 2012 is similar both to the volume that was exported and to the volume flared. Coal production, which was nearly 220 Mtce in 2012, is concentrated in South Africa. The region also accounts for 18% of the world uranium supply. Namibia is referred to as the fourth largest producer of uranium, but with minimal value addition.	A meticulous study on what the importers of uranium do with it will be needed. The vast amounts of energy that nuclear resources have could take the continent out of energy poverty. Each of the countries in sub-Saharan Africa should establish energy institutions that serve as think tanks for the country, and these should interact regularly to start coordinated activities towards universal energy provision. Sometimes it is more effective to work across boundaries than within one country.
8	Low incomes, coupled with inefficient and costly forms of energy supply, make energy affordability a critical issue. Electricity tariffs in Africa are often very high by world standards, despite often being held below the cost of supply. Across sub-Saharan Africa, the wealthiest 20% of households account for about half of total residential spending on energy.	Oil products are subsidised in many oil-producing countries. Where subsidies exist, they are often designed to support energy access for the poor. An opportunity exists here for correct targeting.
9	Inadequate cross-sectorial approaches: A number of sector policies and plans, for example in the agriculture and energy sectors, are not consistent with the directions outlined in the draft Climate Change Strategy Action Plan. There are a growing number of ad-hoc studies on climate change impacts in Namibia and a number of operational research partnerships. These, however, do not necessarily result in a coordinated information and research capacity that can feed into national planning. NamPower will embark on a demand-side management campaign that seeks to replace 20 000 existing electric geysers with solar water heaters. The National Housing Enterprise will construct 185 000 houses between 2012 and 2030, and include electric geysers … this does not make sense because NamPower's efforts would be nullified, and even reversed. Power provision for those houses has not been adequately considered.	The opportunity here is more precisely to specify, prioritise and sequence the activities identified, and to estimate the costs associated with each proposed activity. Institutions such as the Namibia Energy Institute must look at the various approaches suggested by the different government departments and try to harmonise the action plans. Government directives on low carbon development must be formulated and institutionalised. If directives exist, the real opportunity to make effective use of them is when policies are reviewed, because then programmes of action can be formulated with specific reference to resources required, timeframes, and clear indices of success.

10	The lack of attention to renewable energy and energy efficiency options in planning within the energy sector, including the lack of clearly defined targets, creates a barrier to attracting private investment in these technologies.	In the energy sector, a number of initiatives are underway to promote renewable energy and energy efficiency both on- and off-grid, with funding from several donors, as well as domestic funding. There is considerable private sector interest in renewable energy projects, although investment has been limited so far.[2] A real opportunity exists to revise appropriately the country's energy policy, and to formulate a renewable energy policy.
11	Liquid fuels, which are all imported, account for over 63% of net energy consumed in Namibia. Namibia currently imports about 65% of her electricity needs. Besides the offshore Kudu natural gas field, which has yet to come on-stream, no other commercially viable domestic fossil fuel resources have so far been discovered. Instead of producing 800 MW and exporting half of it, the Ministry of Environment and tourism (MET) has been promoting the idea of diversifying the fuel mix used to power the country's fleet of light load vehicles by introducing liquefied gas.[3]	It would be prudent to reduce power imports primarily through development of the Kudu power plant operating on Namibia's offshore natural gas reserves, and to increase the use of renewable power by developing solar PV and wind-power plants. The demand-side management programme will improve energy efficiency. Appropriate feasibility studies would however be necessary.

8 Financial Resources Needed

The African Development Bank has estimated that a universal access system for all 53 countries in Africa would cost a total of US$547 billion to implement by 2030, which averages US$27 billion per year.[17] Total investment has not come close to this mark; instead until recently hovering between US$1–2 billion annually.[18] Recent participation by China and India in the order of US$2 billion annually brings the investment total up to about US$4 billion. The power sector still faces a finance gap in the order of US$23 billion per year, which severely constrains its development options. Operating at a quarter of the necessary budget to grow and expand, current networks must mark most funds for maintenance of aging existing systems.[19]

9 The Way Forward

There are great disparities in the different African regions, caused by, among other things, the still unbalanced development of the energy production and transmission infrastructures on the continent. According to the African Development Bank, 7 000 MW of new power generation capacity is required annually, at a cost of about

17 UNIDO (2009).
18 The World Bank (2012).
19 Foster & Briceno-Garmendia (2010).

US$41 billion per year. Governments alone are not able to finance the development of energy infrastructure, and therefore private sector financing is required. The role of the public sector cannot be underestimated since market risks are still high. Public-private partnerships are ideal for some projects, especially where risks remain high.

An immediate opportunity for Namibia is to integrate solar water heating into the mass housing project currently underway, which seeks to construct 185 000 houses between 2012 and 2030. Calculations show that water heating, alone, for those houses would require the supply of electricity from an additional 130 MW plant operating continuously. Such integration has the potential to kick-start a vibrant solar water heating industry, including manufacturing, installation, repair and maintenance, as well as training and capacity building. It is however quite unfortunate that most of the houses include electric water heaters on their bill of quantities.

10 Conclusion

Namibia needs to focus on increasing the country's own generation capacity by way of an increased use of renewable energy. A greater concerted effort by government is needed to introduce more secure, sustainable and environmentally friendly forms of energy in order to meet future demands.

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4.
100% DECENTRALISED, RENEWABLE ENERGY FOR NAMIBIA

Harald Schütt

1 Introduction

Namibia cannot continue to be electrified by conventional means. A population of 2,2 million, spread over 824 000 square kilometres cannot come up with the financial means to put each of the estimated 465 000 households on grid. And even if all these houses could technically be connected to a national grid, the majority of the Namibian population cannot afford rising prices for electricity, which would be unavoidable to finance the connection and centralised generation plants. According to the Namibia 2011 Population and Household Census[1], 59% (135 084) of urban and 7% (16 512) of rural households are connected to grid electricity, and are thus exposed to the centralised distribution system with all its weaknesses and exorbitantly rising costs and tariffs. To try and finance further investment in the out-dated technical concept of centralised, fossil-based electricity supply from tax-payers' money will put further constraint on the national budget and disappoint many of the people who voted for the new Namibian government, because many long-awaited investments will not be possible since the money needs to be used to service expensive international loans.

Government thus has two choices: either to bring electricity to where the people are, in order to make life more attractive in the countryside to persuade people to stay there, or to wait until people come to where the electricity is. Windhoek grows with approximately 10 000 people per year and approximately 44% of the Namibian nation is now urbanised, as compared with less than 28% at independence in 1990 – indicating massive rural-urban migration.

Namibia is in the historical situation to be able to decentralise Power generation not only technically, but also with regard to the value-streams attached. Estimations say that 20 000 to 50 000 – some say even more – direct and secondary jobs of a permanent, sustainable nature can be created mainly in rural areas if the opportunities that are related to decentralised, renewable energy (RE) generation in conjunction with energy efficiency (EE) are put to use.

Bush-to-electricity can generate power on demand and at the same time employ thousands of workers to harvest the bush and run the power stations, while creating more space for raising cattle. Decentralised photovoltaic (PV) installations can provide

1 NPC (2011:76).

employment for hundreds of people for the processes of setting up and maintenance. The installation of solar water heaters can also provide jobs, provided the decision makers in Namibia make their use compulsory and ban electrical water heaters (EWH), which are installed because of the lower initial investment, but incur exorbitant running cost for making warm water. Other technologies such as concentrated solar power (CSP), with storage, and biogas can fill the gaps when resources like wind and PV cannot meet the need.

New sources such as geothermal potential (hot springs at Gross Barmen, Windhoek, Rehoboth and Ai-Ais), wave power, ocean stream and others need to be explored and made useful for the Namibian nation. Such strategies would decouple power supply in Namibia from internationally linked factors such as the price for gas, oil and coal, as well as exchange rate fluctuations of international currencies, and would provide electricity to Namibian households and enterprises at conditions and prices that are dependent on circumstances prevailing in Namibia, not elsewhere in the world.

Prices for renewable energy can easily be kept at a consistent level, because the source of power generation is free and eternal, while prices for all fossil fuels and nuclear energy are subject to international developments beyond the control of any Namibian.

2 People and Wealth in Namibia

Namibia is one of the countries in the world with the most significant income disparities. According to the 2009/2010 Namibia Household Income and Expenditure Survey, only 6% of the population (corresponding to 10% of all households) have an annual per capita income of more than 58 824 Namibian dollars (Nam$).[2]

According to the 2013 Namibian Labour Force Survey, the unemployment rate has increased by 2,2%, while 41,7% of the youth remain unemployed (compared to 37,8% in 2012).[3] Given the fact of a shrinking job market's inability to absorb the growing number of job seekers, plus the high inflation rate, the economic future of the young, dynamic upcoming generation looks bleak. The capability of the upcoming generations to afford rising prices for electricity can safely be set at zero. Also the existing 33% of the population, who currently use grid electricity, will face hard times, because the top of the income pyramid, decides frequently to invest in solar home systems, meaning they will stop contributing to the national grid, while people at the bottom of the pyramid of electricity users are also forced to leave the system because they simply cannot afford the rising tariffs anymore (Figures 1 and 2).

In the end, these two diverse developments might lead to between 20 and 25% of the population having to foot the bill for the exorbitant investment in 'Kudu-Gas-to-Power' or Xaris and the subsequent infrastructure needed to distribute the electricity to grid-bound customers.

2 NSA (2012:139).

3 NSA (2014:9); see also Nhongo (2014).

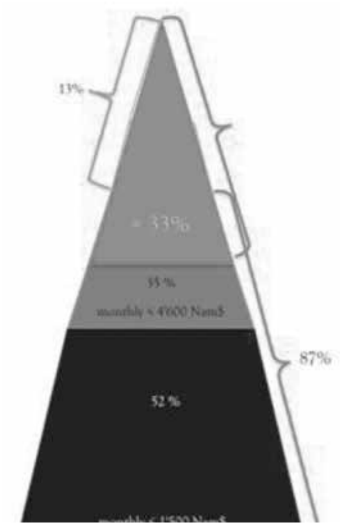

Figure 1: Electricity users now on grid:
Only about one-third of Namibians are on grid
Source: VO Consulting (2012).

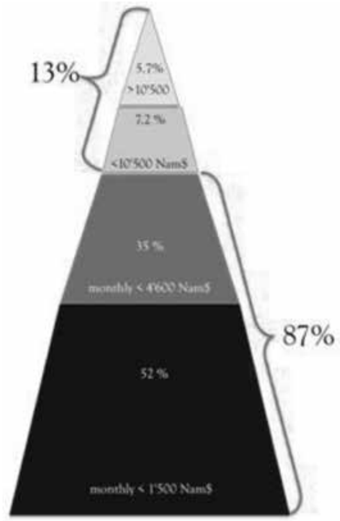

Figure 2: Income pyramid of Namibia
Source: NPC (2006); BoN (2009).

3 Power Grid and Supply Chains

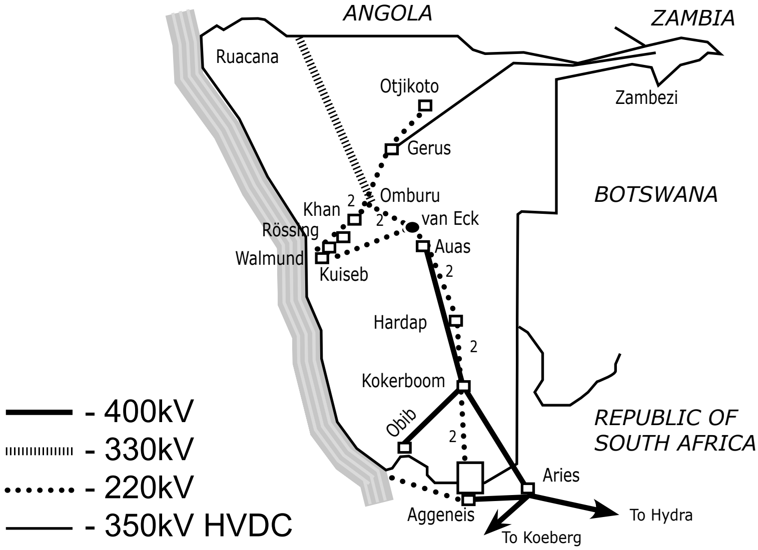

Figure 3: Namibian transmission backbone: Transmission in Namibia is expensive
Source: "Namibia's Electricity Sector", NamPower (9.9.2014).

The existing grid for the distribution of electricity follows the pattern of population density because from the point of view of a distributing entity, such as a regional electricity distributor (RED) or a municipality, the market is where the people are (Figure 3). The more people live close together in cities, the more economical it seems to them to supply people with electricity. More and more high capacity ‘power highways’ need to be constructed and financed to keep the supply going over long distances, albeit at considerable grid-losses. Nobody talks about the related losses and costs of urbanisation, such as slums, water-borne diseases, criminality etc.

The centralised, fossil-based model of electricity provision has been followed all over the world for centuries, because there was hardly any alternative. Electricity had to be generated by big power stations in central locations and subsequently it had to be distributed to users who had to pay for the entire chain of supply. Only recently, some countries, such as Germany and 52 others, introduced Energy In-Feed laws that made it possible for people to generate electricity from decentralised, renewable sources and feed into the national grid at prices that were economically viable for small-scale investors as well as middle-sized power generation.

One significant aspect of all these laws is that decentrally generated electricity has to be purchased *preferentially* and at guaranteed prices by the utilities and distributors. This regulation caused the massive development of technology and administrative systems that will revolutionise electricity supply worldwide. Some few communities, such as Schöneiche and Feldheim in Germany opted also to buy back the local grid from the utilities and run their own power supply on the basis of a cooperative, in which each user has one vote. These cooperatives could realise considerable gains out of their status as electricity-autonomous communities because both investments and revenues come from their members and profits have been realised by them. Thus they can opt to keep prices at consistent levels way below the national average by simply limiting the profits from their investment in the distribution cooperative. Also investors from the manufacturing sector found such conditions very attractive because they can expect stable electricity prices for many years to come. In these circumstances, the local economy grew considerably because many new manufacturing and other companies moved in.

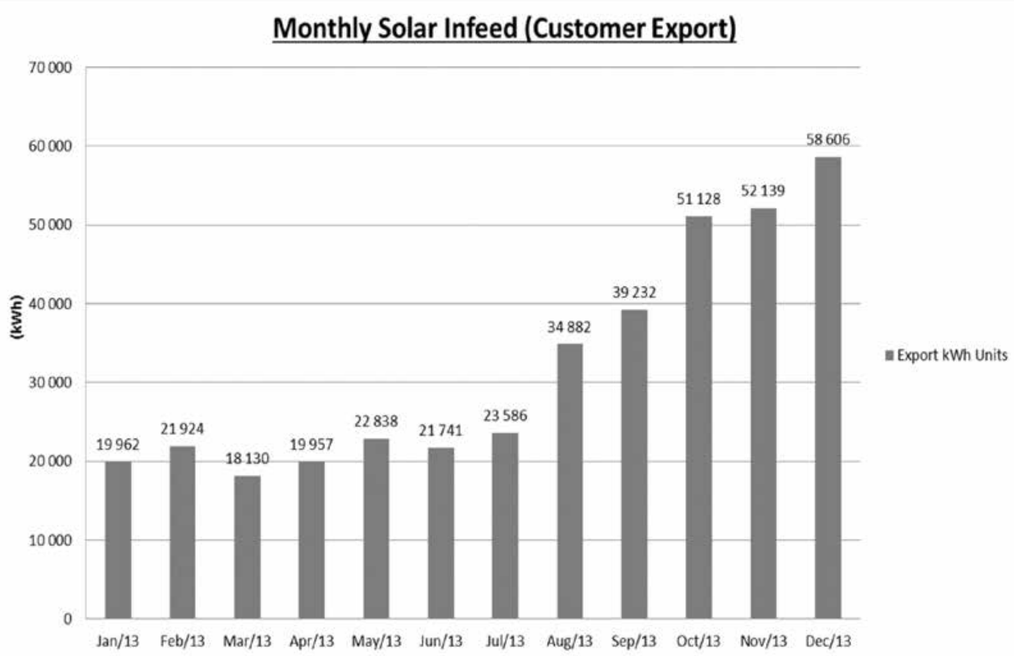

Figure 4: ErongoRED pioneers: Netmetering
Source: Robert Kahimise, ErongoRED, 15.4.2014.

In Namibia, the model of regional electricity distributors (REDs) could have been developed in such a way, but dependency on NamPower as a single buyer of bulk electricity makes the REDs and municipalities prone to the risks that are inevitably linked to a top-down, monopolised supply system. However, ErongoRED took a lead and offered its customers a net-metering tariff of Nam$ 1,08, thus encouraging 84 customers to generate electricity to the value of over Nam$1 million in 2014 in year 1 (Figure 4). The number of "pro-sumers" as well as the number of kWh generated locally is growing by the day.

CenoRED saw reason to follow this example recently and offers Nam$ 0,96 per kWh to customers who are partially or totally generating kWh up to their own usage levels. These are positive examples pointing in the right direction, because they encourage local investment, and channel value-streams back to the community. The restriction is, however, that such net-metering regulations remunerate the local producer only up to the limit he or she is consuming. If a small investor produces more kWh than he or she consumes in one given period of payment, he or she will lose because no compensation is paid for this extra portion of the locally generated electricity. Thus, the local systems are deliberately dimensioned in such a way that they cover only 60 to 90% of the users' own consumption, which does not help much to master the prevailing supply crisis on national level in Namibia.

In recent months, however, a new regulation was introduced by the Electricity Control

Board (ECB), making it less complicated for willing investors to invest in more considerable generation capacities, up to 5 megawatts (MW), which require investment to the tune of 120 million Nam$ (7.5m €). They are still forced to sell to NamPower, so the single-buyer concept is still in place, but here in a modified way: NamPower is signing power purchase agreements (PPAs) with a tariff of Nam$ 1.13 to 1.37 per kWh solar power, pre-determined by the ECB. Capacities above 5 MW have to be tendered internationally, which is a major effort and will not encourage local people to invest in power generation. However, the 5 MW limit is rather high and at present 27 license-holders are busy organising funds and technical expertise for the installation of small power plants with up to 5 MW capacity. The first one is already in operation near Omburo and another one is scheduled to go online in the first quarter of 2016.

4 Opportunities

For the first time in history, the technology, administrative systems and financial means are available to electrify a country 100% from decentralised, RE-based resources. This could send a worldwide signal for the ailing negotiations about climate change and what to do about it! Where, if not in Namibia? The resources in Namibia are boundless! See Figure 5.

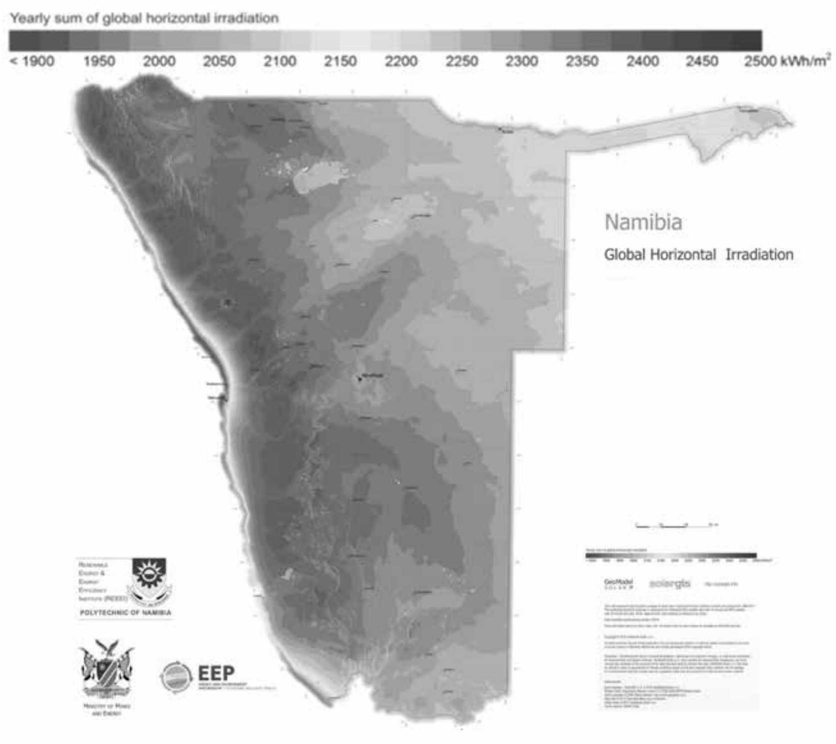

Figure 5: Namibia's solar resources: Thousands of times the total energy need
Source: GeoModel Solar (2012).

Sunshine potential in Namibia is beyond comprehension, biomass is available in abundance, wind is a considerable resource, biogas can be used at specific places, and other sources such as ocean stream and geothermal heat are yet to be explored. Technically, there is no problem to supply all energy used in Namibia from renewable, decentralised sources, which can be owned by companies, cooperatives and individuals based in Namibia. In this way, a further drain of capital could be stopped over time and Namibians would be benefiting not only from a stable price per kWh, but also from all the VAT generated from the consume made possible by the then disposable income that is resulting from the savings on the electricity bill, as well as from the taxes paid in the country.

Furthermore international investors would be attracted by a guaranteed price per kWh over decades!

5 The Bottom Line

The bottom line is often considered to be the money it takes to supply a product or service. At the moment, Namibians are plagued by constantly rising prices for electricity. Paulinus Shilamba said, in his capacity as CEO of NamPower, that the prices per kWh have to rise by 15% annually for at least five years to compensate NamPower for the "necessary" investments. This will mean that electricity will almost double in price over this period (Figure 6). Hardly any of the relevant decision makers has seriously been questioning the necessity of these investments. Hardly anybody has been saying that Namibia's electricity supply is based on dinosaur technology and – even worse, because even more expensive to the end-user – a dinosaur distribution system.

Table 1: Prices are going to double or more

Price increase for electricity					
Price increase per Year in %	**2015**	**2016**	**2017**	**2018**	**2019**
10%	100,00	110,00	121,00	133,10	146,41
15%	100,00	115,00	132,25	152,09	174,90
18%	100,00	118,20	139,71	165,14	195,20
20%	100,00	120,00	144,00	172,80	207,36
25%	100,00	125,00	156,25	195,31	244,14

Source: Table compiled by Amusha 2015.

The income structure of the Namibian population simply cannot cater for price rises of that magnitude in the electricity sector. The percentage of people, who can still afford grid-bound power might shrink, leaving the remaining minority with the burden of not only paying for their own share of price increases, but also of shouldering the amount that is lost owing to the fact that the rich people stop contributing because they go solar, as this investment yields a good return, since self-generation is now cheaper than purchasing kWh from the grid. Moreover, the poorer part of the population might leave the system altogether, because they simply cannot afford the rising price per kWh any longer. Already now we can see an alarming number of advertisements in the classified section of the newspapers, which indicate that many people, especially in the poorer areas of Windhoek and other cities, are losing their houses because of unpaid municipal bills.

NamPower seems to anticipate that tax-payers' money can be used to cover the gap between NamPowers' investment capability and investment necessity, which they call "shareholders' contribution", but which is in fact tax-payers' money. However, here one has to take into consideration that the 33% portion of electricity users and approximately 13% of the population who are income-tax payers are more or less the same group of people, and thus the money will have to come from the same pockets.

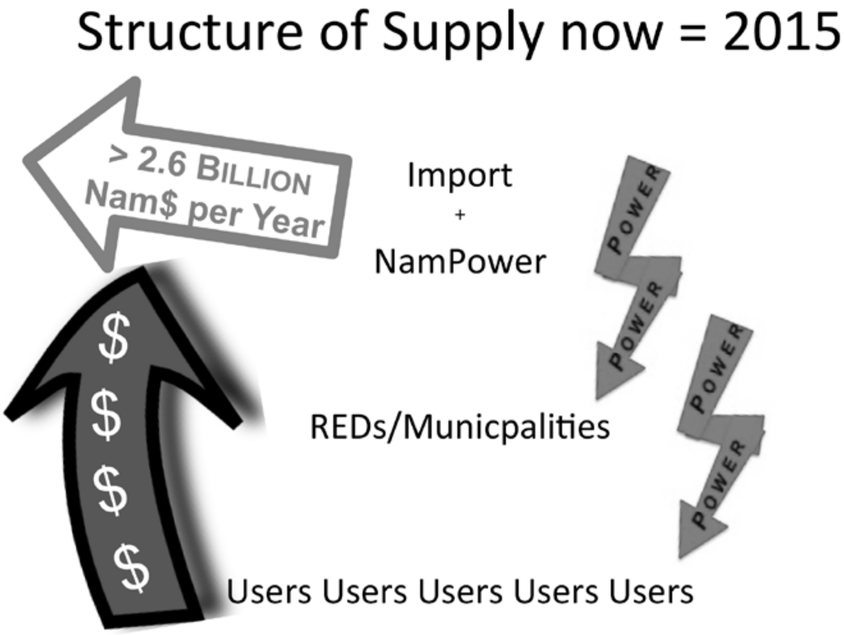

Figure 6: Nam$ 2,6 billion are leaving Namibia per annum
Source: Figure compiled by Amusha based on NamPower (2015:67).

Approximately Nam$ 2,6 billion are leaving the country in this financial year to pay for electricity purchases (Figure 6). This amount is partly financing generation infrastructure in countries such as Mozambique, South Africa, Zambia and Zimbabwe from where the kWh are bought. As soon as the relevant authorities in Namibia introduce net metering on National level and put the Renewable Energy Feed-in Tariff (REFiT) in place nationwide, this amount can stay inside the country and finance the building of decentralised, renewables-based infrastructure for Namibians. This will also mean that in the long run, Namibians will benefit from other Namibians buying electricity, and prices can remain stable over long periods of time because the very source of power is free and forever available. This will, of course, also have a significant impact on the planning of grid infrastructure because a decentralised, RE-based supply system needs local and regional transmission, rather than power-highways over thousands of kilometres.

Europe is now moving away from centralised, fossil-based electricity generation and distribution at a cost of tens of billions of Euros for the transition. Namibia has not yet made the mistake of going the same route of setting up a European solution to the African problem of supplying a widespread population with power. Thus, instead of first paying for the dinosaur concept and afterwards for the transformation in a modern, decentralised, renewables-based electricity supply system, we can jump the stairs and go directly into a future-oriented, decentralised renewables-based system.

6 What Needs to Be Done

Many municipalities use a mark-up on water and electricity to finance their general services and to cross-subsidise some services that do not recover the expenses allocated to them on their own. This is a bad habit from the period before independence and needs to stop. Namibia needs a structural reform to give financial means to municipalities and local authorities to fulfil their duties. In other countries a portion of the income tax and VAT are remaining in the regions where they are being generated. Sometimes also a system to balance the income between 'rich' and 'poor' regions needs to be introduced because in such a system an area with lots of mines will logically be much better off than another region with predominantly subsistence farming as main source of income. In order to curb rural-urban migration, we must invest in the improvement of people's lives in the regions. This will in the end be much cheaper than dealing with the problems arising from hundreds of thousands of people coming to the cities in search of a better life.

6.1 Energy Efficiency First

It does not really make sense to generate electricity with an expensive set-up and then waste it. Therefore we need to review our building codes nationwide, make solar water heaters (SWH) compulsory for all houses in Namibia and introduce other measures to save electricity, such as bringing LED-lights in and shifting high energy-consuming processes to the times of the day when electricity can be generated from PV and be used directly on the spot. These and other aspects of demand-side management (DSM) can save the nation hundreds of megawatts capacity, which can be used more productively for other purposes.

Smart grid management requires energy efficiency at a higher level, usually deploying software that can analyse and predict the needs of most users in a given area at a particular time and adjust the supply accordingly. In Namibia this can be done in comparatively small units, such as villages, suburbs or sections of industrial areas.

Also, tariffs can be used as a tool to adjust electricity demand to the capabilities of RE technology. There is nothing wrong with making a commodity more expensive at a time of the day when it is more expensive to supply, e.g. in the evening. In such a set-up, industry would certainly develop many solutions and tools to use electricity sparingly in order to keep the cost down.

6.2 Work Out a Desired Generation-mix Between Various RE Technologies

Different technologies have different advantages and disadvantages. While PV is comparatively cheap and proven technology, it only generates power when the sun shines. Storing electricity in batteries is – despite recent reports about considerable price reductions – still expensive. Concentrated solar power (CSP) can absorb a lot of solar energy during the day – at a much higher rate of efficiency than PV – that can be stored in the form of heat until the sun goes down or is covered by clouds. Wind is the cheapest of all RE technologies, but is hardly foreseeable and needs therefore to be supplemented by solar power, as well as bush-to-electricity, biogas and other non-erratic technologies, to be able to contribute meaningfully to the national energy supply mix.

In order to attract private investment in all the various technologies, a system must be implemented that equalises their differences in price per kWh generated and still makes it profitable to invest in all of them as far as they can contribute to the national electricity supply.

Since any renewable technology is cheaper over time than fossil or nuclear energy, because the very source of renewable energy is free and abundant, it is only a question of time when renewables will beat fossil energy in price (Figure 7).

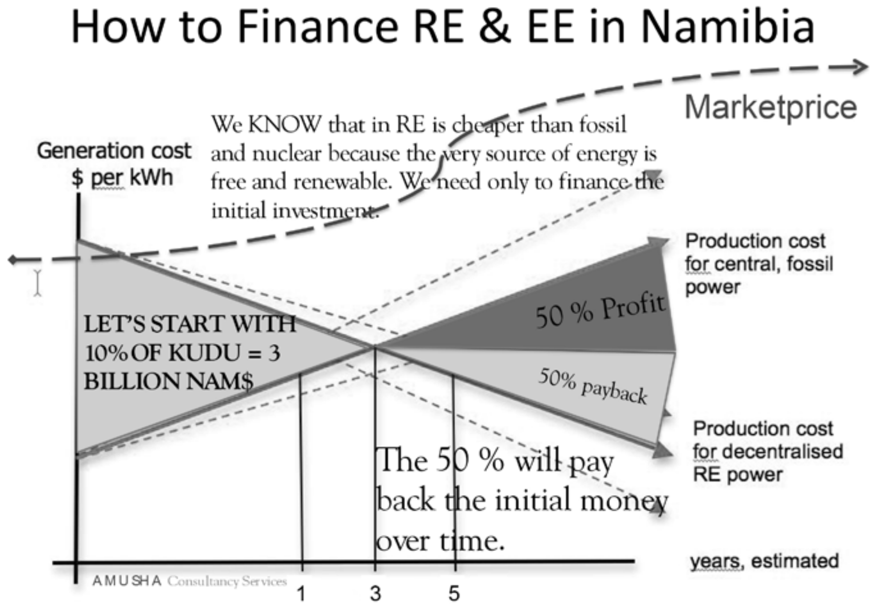

Figure 7: How to finance RE and EE in Namibia: RE is much cheaper and more sustainable

Source: Figure compiled by Amusha (2014).

6.3 Equalise the Difference Between Different Technologies

A public fund, set up to subsidise every kWh generated from renewable sources up to break-even point, can serve as an incentive for investors by offering an insurance against losses. As soon as break-even is reached, the owner, who raised private capital in the first place to build the generation capacity, would have to pay half of the profits made back to the fund in order to enable the fund to finance other projects, promote research and development, and issue bursaries and finance to train Namibians, who will be needed all over the country to install, run and maintain renewable energy generation systems as well as mini and micro networks. The fund should also be used to take the initiative to increase the deployment of RE and EE technologies in Namibia. At a later stage, when the initial amount has been paid back into the fund, the profits can either be paid back to state coffers or they can be used as a basis to introduce the same system in other countries in the SADC and beyond, thus generating profits for Namibia.

6.4 100 000 Roofs Programme

One of the first initiatives that laid the ground for Germany to become the leading nation in the world with regard to renewable energy deployment, was the 100 000 Roofs Programme. In Namibia, such a programme would generate more than double the number of kWh compared to Germany for the same amount of investment, because of Namibia's very high solar regime.

A programme, which would encourage anyone who has a roof or a piece of land to put up some PV panels, would most likely supply far more than the private usage of electricity in the country. It would also channel some more income to those small investors, and this would directly benefit the Namibian middle class. Remember: 2.6 billion Nam$ are leaving the country in 2015 alone!

6.5 5-50 MW Photovoltaic generation (PV)

For industrial use, bigger PV systems should be installed. The size and location should be defined in accordance with the electricity demand and grid capacity in a particular area. Such power plants could be financed and run as private enterprises or by consortia of the users, like for example in the German town of Schönau and Feldheim. As electrical storage becomes more and more affordable, such privately owned power plants could supply the grid directly or in conjunction with storage, which would enable them to get different tariffs remunerated at different times of the day.

6.6 Concentrated Solar Power With and Without Storage

Concentrated solar power (CSP) is – depending on which technologies are compared – up to four times more efficient than PV. CSP can be deployed on its own, supplying a steam turbine or driving a Stirling engine. CSP plants come in sizes from 30 KW to hundreds of MW, with storage for different periods of time and without (Figure 8).

Figure 8: CSP trough at Plataforma Solar de Almería, Spain

Source: http://solartribune.com/wp-content/uploads/2012/05/Parabolic-troughs-at-the-Plataforma-Solar-de-Almeria-CSP-facility-in-Spain.jpg, last accessed 4 February 2016.

6.7 Bush-to-electricity

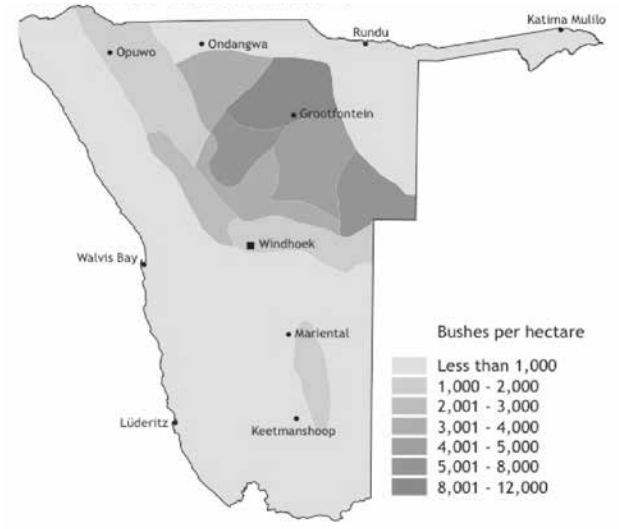

Figure 9: Bush encroachment in Namibia – curse or resource? Biomass works when the sun doesn't shine

Source: Von Oertzen (2010) Adapted from Bester (1999).

Namibia has an unwanted resource of invader bush. Different sources quantify the area infested with this bush as around 30 million hectares (Figure 9) and the biomass as more than 100 million tons. This bush grows so densely that cattle cannot pass through it. The bush prevents grass from growing and consumes a lot of water, so that the land often becomes unusable for farming purposes. Standard methods of de-bushing can cost as much as the value of the land and there are hardly any farms in Namibia that are earning enough for the farmer to buy back his/her land every five to twelve years, which is the regrowth period of the bush.

Decentralised small generation units under the control of the farmers can as a combined capacity produce up to 150 MW of electricity on demand, thus providing a perfect supplement to other renewable energy generation options. Such a broad-based initiative can turn the unwanted bush into a resource, make the de-bushing cost-neutral to the farmer, and create tens of thousands of jobs in the rural areas – which will also mitigate rural-urban migration. More grazing space will also enable farmers to raise more cattle.

6.8 Wind Power

Namibia has more than 30 000 wind pumps in use on farms all over the country. Using wind power is therefore not new to Namibians. How to feed electricity generated from wind into the public grid, however, is another story.

In principle, wind is the cheapest source of electrical power from renewable sources. The problem is how to deal with the times when the wind does not blow and how to compensate both the investor and the off-taker for the fact that both generation capacity and downtime are unpredictable. Since the late 1980s, the city of Lüderitz has been identified as the place where wind generation would be most economical. Several projects have been designed and negotiations are on-going with the license-holder about how and when 44 MW, 80 MW or up to 150 MW of wind generation capacity can be installed. A decisive intervention from relevant authorities could help either to commence with the project very soon or to allocate the license to other investors who would be prepared to start building the power plant within a short period of time.

New technologies such as vertical axis wind turbines make it possible today to also generate electricity on small-scale level at lower wind speeds. If provided with the right regulations, small wind generators can even be installed at household level and feed power into a local grid after contributing to the consumption of the owner.

Figure 10: Vertical axis generators in conjunction with photovoltaic seen in Swakopmund
Photo: Amusha (2015).

6.9 Biogas

Biogas can be generated from all kinds of organic materials: plants, dung and even human waste. The City of Windhoek is already running a biogas project at the wastewater treatment plant. With some technical support and a guaranteed market for kWh to feed into the grid, abattoirs, feedlots, waste disposal facilities, water treatment plants and even some farms can produce sufficient biogas to satisfy their own needs for heat and electricity and also to help generate much-needed power for other operations.

6.10 Other Technologies to Be Explored

Wave power, and ocean stream as well as geothermal energies are promising resources that should be explored for the benefit of Namibians. The country has hot springs in Gross Barmen, Windhoek, Rehoboth and Ai-Ais, but it is not known what potential lies in between. Geothermal energy is one of the cheapest options and should not be ignored in a 100% renewable energy mix. Wave power and ocean stream technology have been explored on international level and the relevant Namibian institutions should be part of such processes on international level and put Namibia on the map of modern, future-oriented technology development.

6.11 The Grid

Key to all these promising ideas and intentions is the grid and the many mini and micro grids that should be in operation in Namibia. A grid does not only technically transport electricity at the speed of light from one place to another, it also defines the monetary conditions under which electricity can be traded and exchanged from one feed-in point to another and finally be delivered to the customers. The most important factor for any grid is stability. Electricity can technically be generated and even transported in many voltages and frequencies; but for a professional grid very strict standards need to be observed in order to minimise grid losses and to deliver the power to the consumer in a form that will not damage the devices the customer wants to deploy, while ensuring that all electrical appliances can be utilised safely and productively. In Europe the widespread systems to feed decentrally generated electricity into various types and sizes of public grid have led to the development of electronic control devices, which can regulate the quality and quantity of electricity to be fed into the grid without compromising stability and technical standards. Namibia can make use of such technologies and adapt them to the specific conditions prevailing in the country, such as long distance between feed-in points, etc.

The grid also needs to be managed in a way that is optimised for efficiency. Smart grid management is therefore an integral part of a national plan towards a sustainable supply of power. One of the characteristics of a smart grid is that the connections are planned and installed in a circular manner, rather than as a one-way route. The new grid and grid extensions should be planned and installed in such a way that they can handle bi-directional flows of power, as well as the capacity to absorb more feed-in capacity in a given area than the same area consumes – which is a stumbling point at the moment. Smart grid management could also include ripple control, which would allow the grid-operator to switch off specific devices such as air conditioners and electrical water heaters (as long as they are still allowed to be in use). These and other technical issues need to be studied and implemented in order to enable Namibians to generate sufficient, reliable and affordable electrical power for Namibians from many renewable sources.

6.12 Import / Export

Especially during the initial period of change – estimated to last for five years – it will still be unavoidable to import electricity from other partners within Southern Africa Power Pool (SAPP). However, the strategic objective to become a net exporting country should be pursued from the beginning. Initially, it might be possible to export power only occasionally and at peak times of RE-generation, but with the rapidly growing RE capacity in Namibia, in conjunction with growing experience and expertise, more regular patterns of export at foreseeable periods can be determined. Such predictable capacities can be offered at higher price within SAPP than erratic power surplus every now and then.

Since the biggest electricity user in the region, South Africa, has a more industry-typical, bell-shaped user curve, that is dominated by commercial users operating predominantly during day-time hours, while Namibia is struggling with its evening peak that is mainly caused by domestic applications (such as EWH, light, entertainment and cooking), an exchange agreement might be feasible, in which Namibia supplies RE-generated kWh to the day peak in RSA, while RSA can return kWh from their predominantly thermal generation capacities at their off-peak times, when the sun does not shine in this part of the world.

6.13 Storage of Electricity

Unlike South Africa and many other countries, Namibia does not have suitable natural conditions for pumped storage. Pumped storage is a system where water is pumped upwards into a higher lake, dam or basin (e.g. in mountains) at times when surplus electricity is available and then it is allowed to run down again though a turbine at times when more electricity is in demand. However, gravity power storage shows a way out of that dilemma.

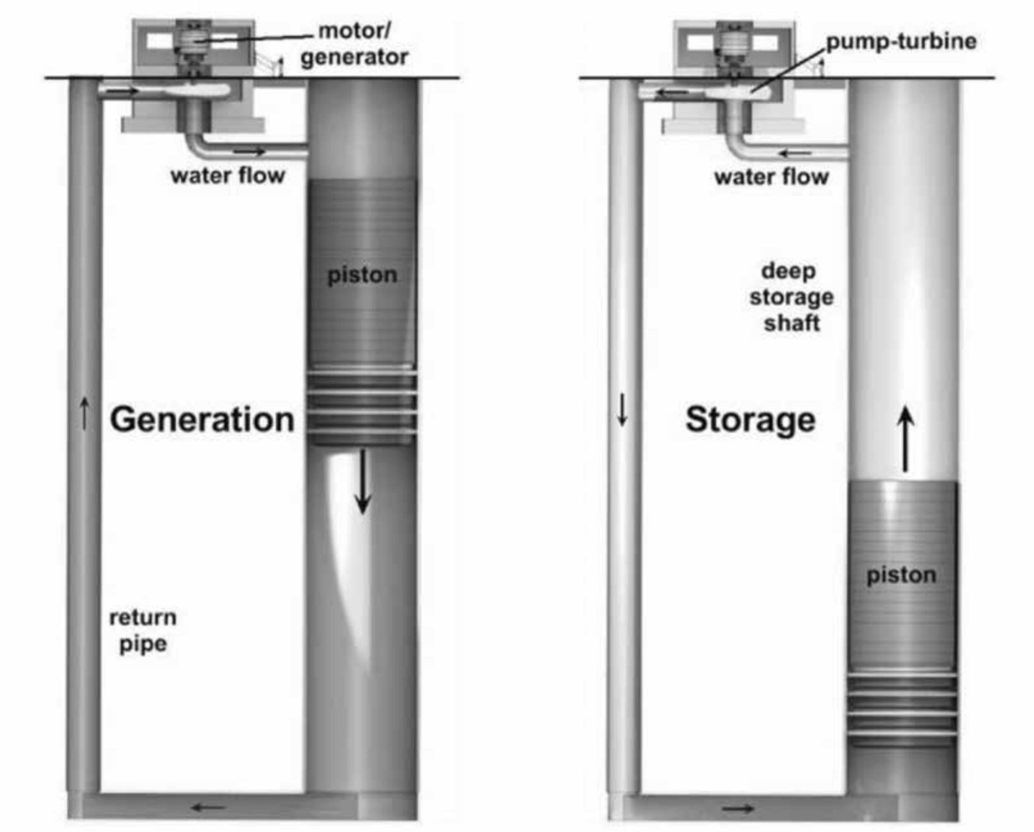

Figure 11: The Gravity Power Model
Source: www.greenpatentblog.com/2012/04/09/newton-would-be-proud-gravity-power%E2%80%99s-technology-has-great-potential/, last accessed 4 February 2016.

A big round hole is dug in the ground and the walls are stabilised with concrete. Then a piston is installed and the space above and below the piston is flooded with water. As soon as the renewable systems produce surplus electricity, water is pumped from the top to under the piston, pushing it up. When electricity is needed, a valve can be opened and the piston will press the water through a turbine that is spinning a generator. Such a system is quite efficient and can help store surplus energy so that it does not go to waste.

Another technology uses compressed air to store energy. A very big rubber bag is used to fill a big space, like a tunnel in a mine, which holds the bag in position tightly. Surplus electricity is now used to pump air into that rubber bag and compress it. When more electricity is needed, a valve can be opened and the compressed air again spins a generator.

The most common storage nowadays is thermal storage in conjunction with a CSP Power plant. A big tank of appropriate liquid and/or molten salt is heated up during the sunshine hours of the day and converted into electricity when needed using a steam turbine.

Chemical storage is possible, but is still quite expensive on large-scale level. In a household that is well constructed and made as energy efficient as possible, a battery the size of a fridge can keep things going for a couple of hours. In Germany, a new project has been launched called Electricity Bank, where participating families and small companies feed the surplus electricity they can generate into chemical batteries in their houses and at company premises, which they can use later, when they are in need. This is one effort to find new ways of increasing the opportunities for private generation and own consumption.

Namibia should explore all these opportunities and become a partner for enterprises, institutes and universities, which are developing these technologies to make them ready for worldwide application.

In general, it is clear that technologies are available; the decisive factor is the political will.

6.14 The New Role of NamPower in a 100% Renewably Energised Namibia

According to Paulinus Shilamba, NamPower has 953 employees. The staff and management represent decades of experience in both engineering and administration of a centralised distribution system in a developing country. Having taken over an infrastructure from the colonial regime in 1990 that was planned and prioritised to supply 5% of the population – and by chance also provided electricity to a few others – it is a remarkable achievement to have kept electricity flowing under these circumstances without major flaws or blackouts. We must, however, take note of the fact that two-thirds of the Namibian population lives in a permanent blackout situation, since they simply do not have access to the grid.

The current system – inherited from the colonial regime – follows mainly the line of thought that was developed centuries ago in industrialised countries. For this, nobody is to blame because that was – and is for many people – still the one and only relevant and proven way to supply electricity to a country. Most industrialised countries have population densities of more than 150 people per square kilometre (except USA at 32pax/km^2 and Australia). Namibia's population is about 2,2 million spread over 824 000 km^2, resulting in 2,67 people per square kilometre. Extending the national grid to people living in small settlements all around the country is simply not cost effective, especially in light of the fact that people in remote areas often have little access to cash to pay for electricity.

Within the existing system, the national decision makers therefore have two choices: either to subsidise the extension of the national grid forever or to do nothing, which will result in people moving to where the power is. According to Namibia's Population and Housing Census, less than 28% of Namibians lived in cities in 1990. Twentyone years later, in 2011, urbanisation was 42,8%. Now it is estimated to be more than 44%. While this concentration of many people in a relatively small area seems at first sight to be good news for a centralised system of electricity supply, we must take note of the fact that only 78% of urban Namibians actually have grid electricity at their disposal (rural inhabitants have 7%). In addition, the fragile ecology of the country simply cannot support big cities – there is not sufficient water, nor infrastructure, nor jobs, and still more than half of its food is imported. The vast majority of new city-dwellers are poor, meaning that they do not have the means to purchase sufficient and healthy food, especially not when this food has to be transported over long distances and is traded – with mark-ups being added every time it changes owner. Under these circumstances, electricity for most shack-dwellers is a luxury they cannot afford at all. Through subsistence agriculture, rural people have greater control over their food supply than urban people do. De-centralised electricity can therefore become a vital additional incentive to keep people in rural areas.

It is therefore of pivotal interest for the nation to bring electricity to where the people are, instead of waiting until the people go to where the Power comes from. This can not be achieved with the currently existing system.

NamPower, as a state-owned enterprise should therefore manage the transition from a centralised, fossil-based supply system to a decentralised renewables-based system. This is a technical challenge and it will turn the economic structure of electricity supply in Namibia around. Instead of sending amounts such as Nam$ 2,6 billion and more out of the country every year, NamPower should help building structures to keep these funds circulating among Namibians with special emphasis on Namibians in rural areas. In other words, to manage the transition from an electricity importing to an exporting country, which may well include earning an income from mark-ups between buying price for renewable energy in Namibia and selling price to partners in SADC. While at the moment Namibian electricity customers help finance the building of generation infrastructure in Mozambique, South Africa, Zambia and Zimbabwe, customers in these countries can buy surplus electricity from Namibians and thus help finance the building of decentralised, renewables-based generation capacity in Namibia itself. NamPower is the only existing entity that has the expertise and the infrastructure to cut deals of this nature and magnitude.

NamPower should also support municipalities and Regional Electricity Distributors (REDs) as well as the Electricity Control Board (ECB) in planning and implementation of new structures for power supply.

The knowledge and decades of experience vested in NamPower also enable this exemplary state-owned company to take on other tasks, which certainly will come up during such complex processes.

It can also be assumed that other developing countries will follow the path when Namibia sets the example and NamPower and the people working there can become consultants for other utilities on how to manage their transitions towards a sustainable and cost-effective electricity supply.

7 Conclusion

Namibia is at a crossroad.

Either the country makes – and *pays* for – the same mistakes that the old industrialised economies did, meaning it tries to install a centralised, fossil-based electricity supply system nationwide (Figure 12, which is even more problematic in Namibia than elsewhere because of the low population density and widespread poverty; or the country learns from new developments that its previous colonisers paid for dearly, meaning that Namibia opts for a decentralised, renewables-based concept, which will produce electricity where it is needed (Figure 13) and keep the money circulating among Namibians instead of taking it outside its borders, to benefit a few and finance development elsewhere.

The present structure of supply is depicted in the following figure:

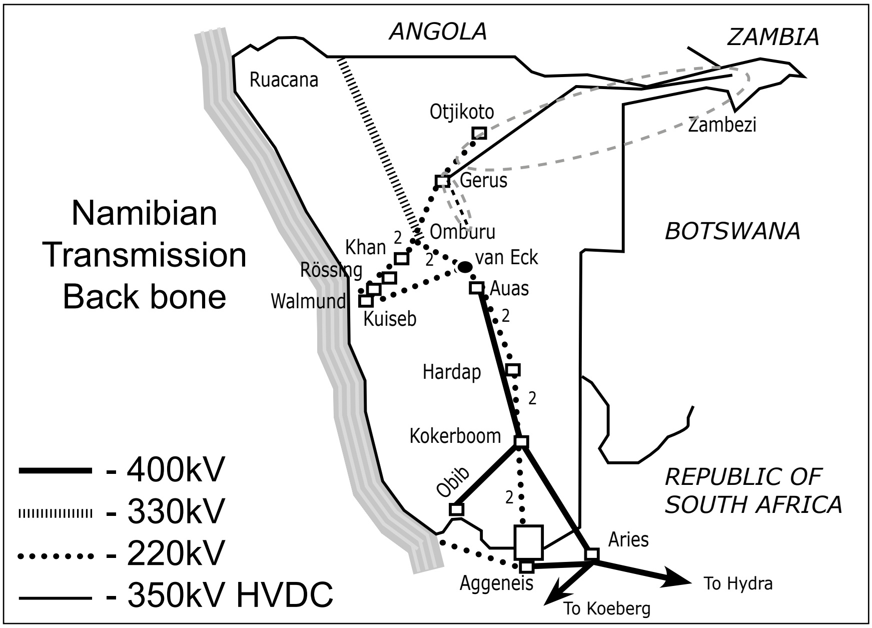

Figure 12: Existing grid
Source: NamPower (2012).

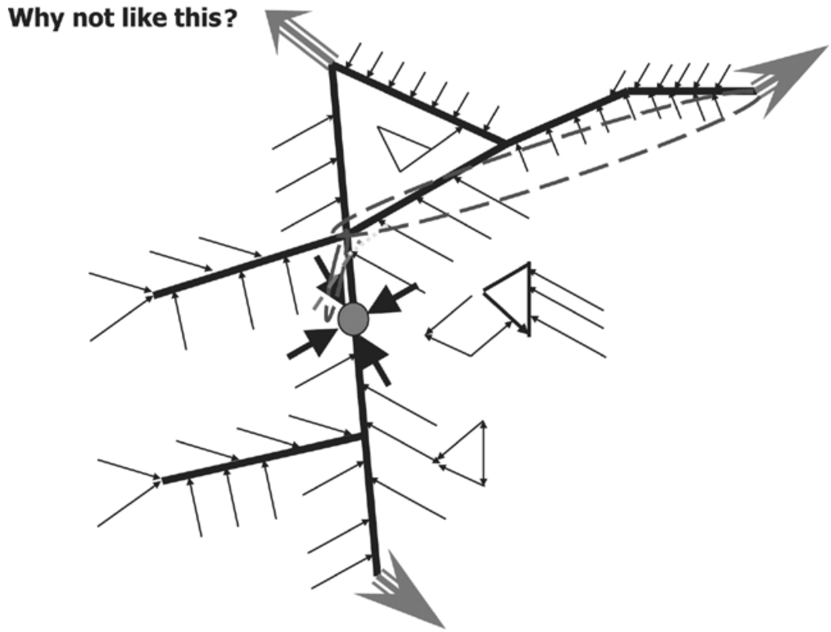

Figure 13: Desired grid structure: Everyone is contributing to his/her ability
Source: Figure compiled by Amusha Consultancy Services.

The energy future of Namibia has already started; the world is on the move because the old fossil fuel systems simply cannot deliver any longer. They are financially risky and also unpredictable as well as detrimental to the climate and environment; in short they are unsustainable.

Future industrialised societies anywhere in the world will be based on renewable energy generation, in conjunction with energy efficiency.

RE and EE will also create jobs for Namibians by establishing value chains for the majority of the people, rather than further concentration of wealth in the hands of the few.

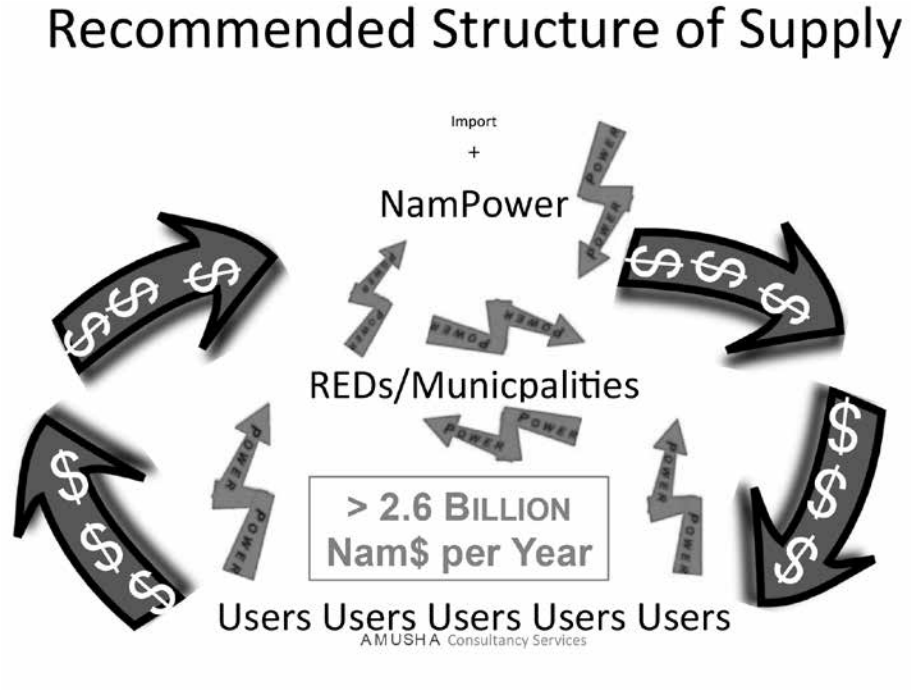

Figure 14: Recommended structure of supply: Money can rotate among all stakeholders
Source: Figure compiled by Amusha Consultancy Services.

With renewable energy, the majority wins because the money stays inside the country (Figure 14) to create wealth for Namibians by Namibians.

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5.
REEE-POWERING NAMIBIA – ENERGISING NATIONAL DEVELOPMENT

Detlof von Oertzen

1 Introduction

Namibia's solar, wind and biomass resources are abundant, and constitute a comparative national advantage that can be used to the country's long-term socioeconomic benefit.[1] However, despite these natural endowments, their productive use and large-scale application remains limited. This is puzzling, as on closer inspection, few compelling reasons exist that would explain why the uptake and use of renewable energy (RE) and energy-efficient (EE) technologies cannot be dramatically accelerated, and, in this process, vigorously energise Namibia's development.

Energy is a prerequisite for almost all aspects related to economic development. Other key ingredients, such as the availability of adequate human capacity and resources such as water, food, shelter and many others, depend in some way or form on whether energy is available, accessible and affordable.

Internationally, there is consensus about the importance of universal access to modern energy, which is seen as a prerequisite and principal enabler of national and human development.[2] There is a considerable degree of positive correlation between energy use, economic growth and the level of national development. Improved access to energy creates a variety of personal and national development benefits, including the upliftment of livelihoods, improved health and education outcomes, increased income through productive uses of energy, and human dignity.[3]

Poverty reduction can take place by way of increasing household incomes and, more important, by improving the health, education and productive capacities of individuals. It is therefore useful to take the immediate and direct impact that energy has on raising incomes into account, and also to consider the many indirect impacts that an improvement in access to energy has on our education, health and other critical drivers of national development.

Poverty in general, and energy poverty in particular are societal traps that necessitate

1 Von Oertzen (2012).
2 IEA (2014).
3 AfDB (2014); Jones (2010).

deliberate intervention. By addressing poverty in general, or energy poverty in particular, beneficiaries are unshackled and ready for greater participation in personal and societal development efforts.[4] Lifting people out of energy poverty creates opportunities which transform lives for the better.

This paper highlights some of the opportunities that Namibia can embrace to place national development on the road to positively transform lives, and lead to desirable and sustainable development outcomes. It describes how investments in RE and EE can stimulate development and strengthen the nation's social, economic and environmental fabric, by uplifting those in energy poverty and by creating local jobs, local value and thereby invigorating national development. We introduce the phrase 'REEE-powering', which is to mean *the deliberate switching to electricity supplies powered by RE resources, as well as the use of EE technologies, and energy storage, to promote local value creation*.

Central to the concept of REEE-powering is that local value sources, such as Namibia's considerable renewable energy endowments, should be converted into local economic value. In its wake, REEE-powering is expected to enhance Namibia's energy security, to reduce long-term currency outflows and exposure to foreign exchange fluctuations, and to enhance resilience against climate change. REEE-powering Namibia can be achieved by enabling energy sector participants to maximise the value of their own energy expenditures, and to enhance the re-circulation of capital in the local economy. In this way, the transformation of the country's energy industry becomes a democratisation process that establishes the foundation for sustained national development, and deliberately leverages Namibia's abundant renewable energy endowments to energise national development in all its facets.

In 2015, Namibia's energy sector in general, and the electricity sector in particular, was in a precarious state. The country continues to be extremely dependant on energy imports, and billions of Namibian dollars leave the country every year to pay for them. This perennial currency outflow drains the economy. This money could have been used to create local jobs, to create local opportunities, and to lift Namibians out of poverty.

In contrast, the deliberate use of locally abundant renewable energies, an increase in the use of energy-efficient technologies and the application of energy storage, where viable, would create long-term local value. The choice of REEE-powering is therefore also a choice for local value creation, and against the perpetual export of national development opportunities. Today, Namibia's energy sector exports development opportunities, which limits local growth. But the country's energy sector can be transformed, and this is what REEE-powering is about.

Today, a flood of increasingly affordable technologies is available that allows electricity end-users to produce some or all of their electricity requirements and, at the same time, dramatically reduces their demand for electrical energy. Renewable energy technologies, and solar photovoltaics (PV) with storage, in particular, are game changers. Solar PV is

4 Practical Action (2014).

a low-carbon emission, energy-generation technology, with applications ranging from the supply of a simple light bulb to powering entire regions. In combination with energy-efficient technologies and modern energy storage devices, these technologies will begin to undermine today's centralised and highly protected utility business models, and will markedly influence their future operations and viability. REEE-powering therefore has far-reaching consequences for the country's citizens, businesses, institutions and utilities.

The remainder of this article is structured as follows:

- Section 2 provides a brief overview of Namibia's energy sector as a whole;
- Section 3 showcases the benefits of REEE-powering rural and urban Namibia;
- Section 4 highlights how commerce, industry and large power users can benefit from REEE-powering;
- Section 5 illustrates how Namibia's electricity utilities could benefit from RE and EE, and describes the roles of independent power producers and the national utility NamPower;
- Section 6 offers concluding remarks and reflections on how today's energy-related decisions can positively energise national development by REEE-powering Namibia.

2 Namibia's Energy Sector

Namibia's energy sector relies on the following primary energy sources (i.e. energy contained in fuels and other energy carriers that has not yet been transformed): liquid fossil fuels, such as diesel, petrol, paraffin, liquid petroleum gas and related energy carriers; biomass, in the form of wood, processed wood products and charcoal; and coal, to a lesser degree.[5]

The country's main secondary source of energy is both imported and locally generated electricity.[6] The largest percentage contribution of locally generated electricity is from hydropower, and a small but growing proportion from solar energy. The consumption of primary and secondary energy sources over the past decade is shown in Figure 1.

5 See Von Oertzen (2015b).

6 (ibid.).

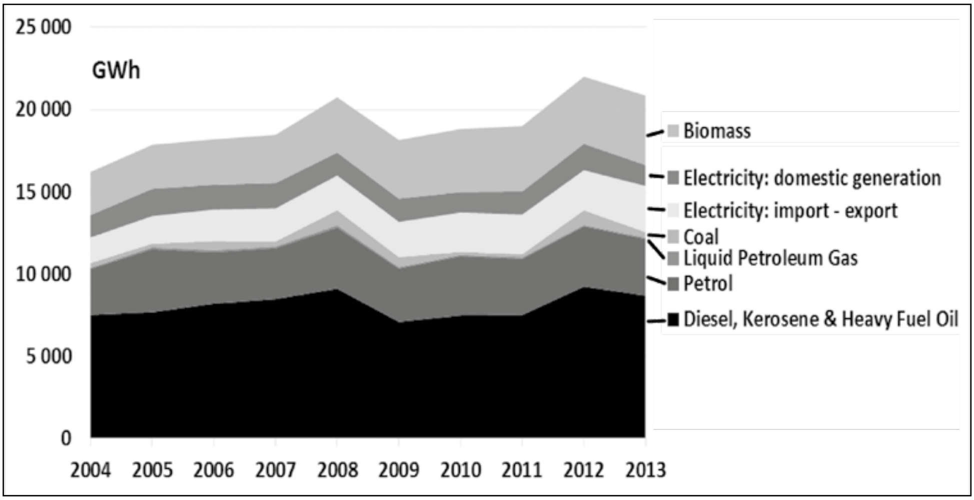

Figure 1: Namibia's total primary and secondary energy supplies, in GWh
Source: Von Oertzen (2015b).

The average growth in total energy use in the period between 2004 and 2013 amounted to some 2.4% per year, while electricity consumption grew by an average of 3.1% per year. Considerable year-to-year variations characterise the use of energy in Namibia, which is in part due to local market responses to both global and local economic changes.

The total energy use per person per year increased from some 8 400 kWh/person/year in 2004, to almost 9 500 kWh/person/year in 2013, as shown in Figure 2.

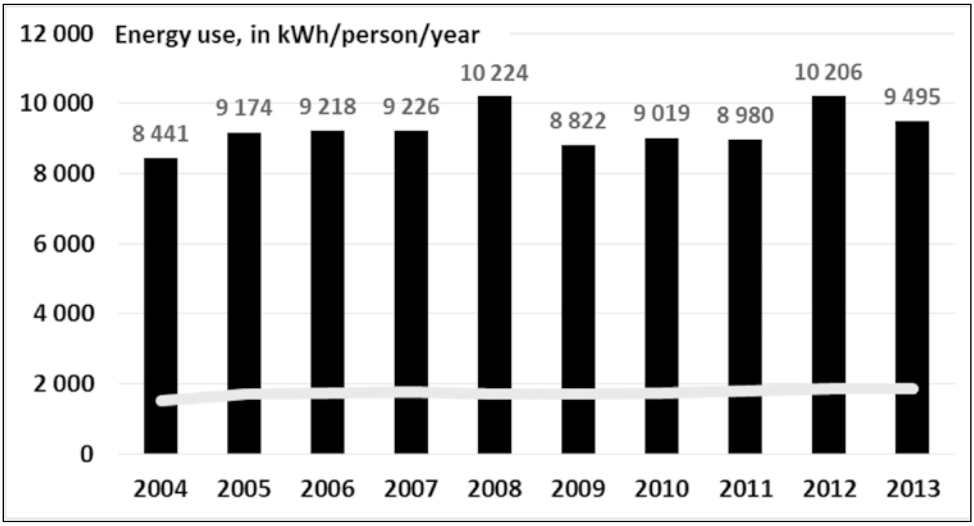

Figure 2: Total annual energy and electricity use (yellow line) per person, in kWh/person/year
Source: Von Oertzen (2015b).

A measure of a country's economic output is the gross domestic product (GDP).[7] Figure 3 shows Namibia's total energy use between 2004 and 2013, in Terawatt-hours per year (abbreviated TWh/a)[8], and the nominal GDP in billions of N$ per annum (abbreviated bn N$/a).

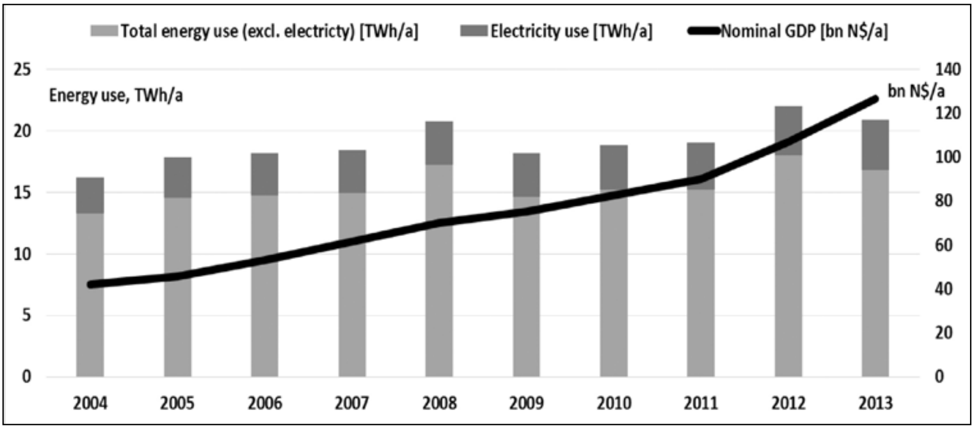

Figure 3: Namibia's energy use and nominal gross domestic product
Source: Von Oertzen (2015b).

Comparing the average energy consumption per person between developing and developed countries offers some insights into specific countries' state of development. It is generally accepted that a causal link exists between a given quantity of energy consumed and the associated economic activity.

An indicator that is often used to quantify the level of development of people living in a particular country is the Human Development Index (HDI), which combines socioeconomic aspects, educational attainment, life expectancy, poverty, income inequality, gross domestic product and the environment into one indicator that ranges between 0 and 1.[9] Countries such as Namibia, Botswana and South Africa have an HDI in the range of 0.6 and 0.65, while countries such as Zimbabwe, Sierra Leone and Somalia have an HDI of below 0.4.

Figure 4 shows the HDI of some 100 countries, as a function of the total energy use per person per year. In 2014, Namibia's HDI was slightly above 0.6,[10] and the total average annual energy consumption per person amounted to some

7 NSA (2013); BoN (2014).

8 One TWh is equivalent to one thousand GWh, one million MWh, and one billion kWh.

9 See UNDP's Human Development Index available at http://hdr.undp.org/en/content/human-development-index-hdi; and for the launch of the 2014 Namibian Human Development Report http://www.na.undp.org/content/namibia/en/home/presscenter/articles/2014/08/13/2014-human-development-report-namibia-launch/, last accessed 4 November 2015.

10 (ibid.).

9 757 kWh/person/year.[11] Namibia's neighbours, including Botswana and South Africa, have HDI attainments similar to those of Namibia, but both have higher per capita energy consumption rates.

Figure 4 also allows for some broad observations: given Namibia's per capita energy consumption, its HDI should be higher, as is for example achieved by Tunisia. In other words, Namibia should have achieved a higher HDI given the amount of energy that is consumed on a per capita basis. The country's energy intensity is higher than is reflected in its HDI. Other countries achieve higher levels of development with similar amounts or less energy consumed per person than is the case in Namibia.

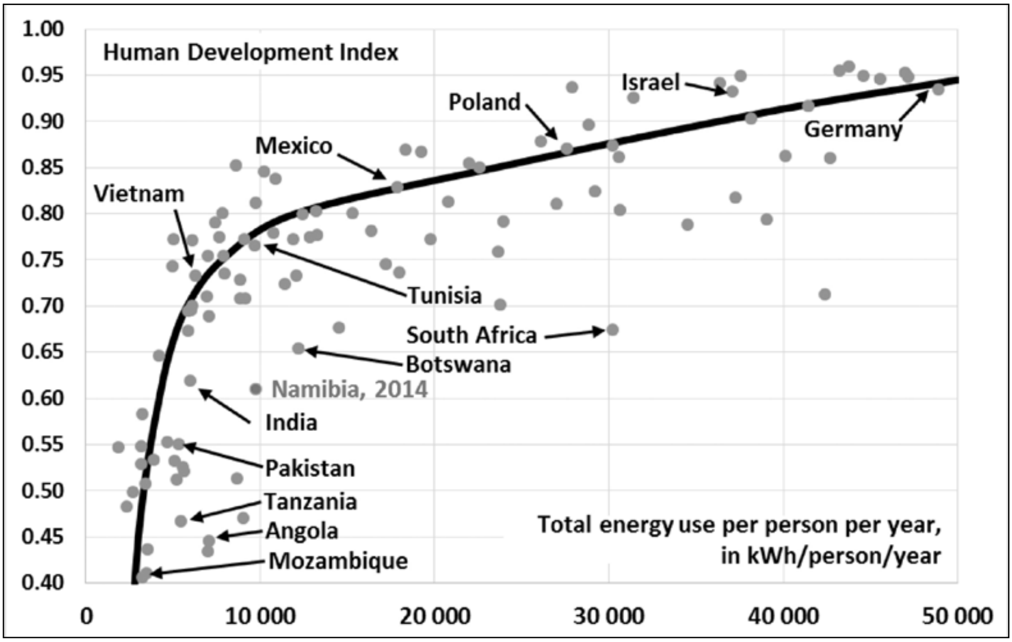

Figure 4: Human development index (HDI) as a function of the total energy consumption per person per year, in kWh/person/year

Source: Von Oertzen (2015b).

Namibia's development challenges are complex and have many characteristics that do not seem – at first sight – to be related to energy at all. However, poverty, challenges in the water sector, the scarcity of home-grown food supplies, the vulnerability to a changing climate, crime and a host of other symptoms relate in one way or another to how the country makes energy available for end use, to whom such energy is provided, and how much it costs.

11 Liquid fuel consumption data for 2014 were unavailable when this article was finalised. We have therefore made a projection of the 2014 liquid fuel consumption, based on historical trends and local growth in 2013/2014, and included this in the total energy consumption figures for the year.

Rarely do energy debates consider the systemic and potentially significant positive implications that well-planned and thoroughly implemented energy supply systems have on a country's economy, its societal development and the environment. However, short-term energy decisions – especially those that are taken when trying to address an energy crunch quickly – often stand in the way of the multiple potential benefits that can be reaped through longer-term strategic investments, and a focus on local sustainable energy supply systems. In fact, crisis management may bring about short- and long-term costs that harm or reduce the potential benefits that the energy industry could catalyse in the country.

An energy supply system that is underpinned by renewable energy technologies – in contrast to an energy system based on imported fossil fuels – creates local re-enforcing feedback loops in which human and financial capital benefits through local use and re-investment. This creates local value through human capacity development, direct and collateral investments, job creation, the generation of taxes, and the strengthening of local supply chains. In contrast, high-input conventional energy supply systems operating on fossil fuels create value streams that permanently leave the investment locality, and therefore, in the case of Namibia, the country. As part of its design, such dependence on fossil fuels leads to permanent capital flight, thereby reducing the ability and the incentive to invest and build local structures.

3 REEE-Powering Domestic Energy Use in Rural and Urban Areas

This section showcases how rural and urban Namibia can benefit through the deliberate adoption of RE and EE technologies, and outlines the requirements to systematically provide access to modern energy services for all the country's citizens.

The 2011 Namibia Population and Housing Census identifies the main domestic energy uses for cooking, lighting and heating.[12] Wood and wood products such as charcoal remain the prevalent energy source for cooking, with some 54% of all Namibian households continuing to use wood or wood products for cooking, and with some 86% of all households in rural Namibia and about 20% of households in urban areas still using this energy source today.

12 NSA (2011).

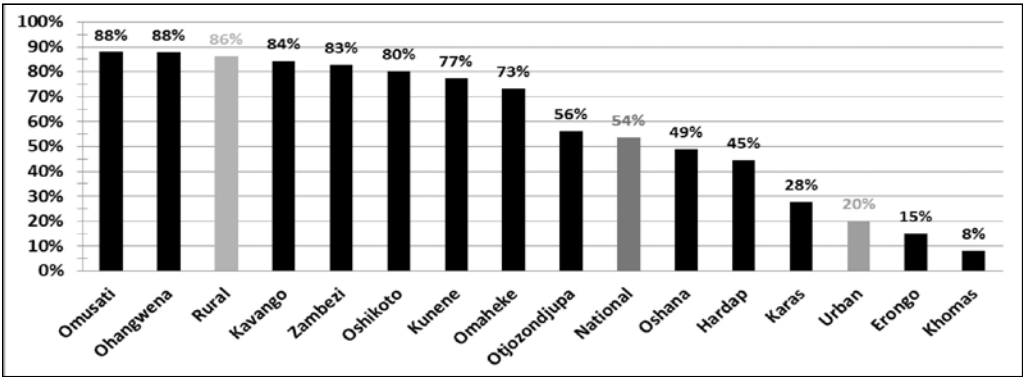

Figure 5: Percentage of Namibian households using wood or wood products for cooking
Source: Von Oertzen (2015b).

Nationally, electricity is the most common source of energy used for lighting: some 42% of all households make use of it.[13] In urban areas, some 70% of all households report using electricity for lighting, in contrast to only some 15% in rural Namibia.

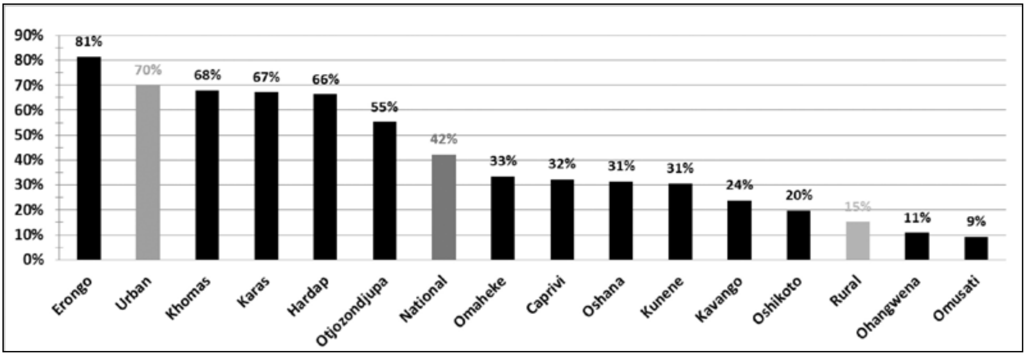

Figure 6: Percentage of Namibian households using electricity for lighting
Source: Von Oertzen (2015b).

The following statements are often heard: "Namibians do not have adequate access to energy", and "access to modern energy is a universal right". Before drilling deeper, it is useful to clarify what is meant by access to energy, and what universal access to modern energy could possibly imply.

We put forward the following basic definition for 'access to energy' in order to guide our discussions: access to energy means that a person *is able to use one or several forms of energy to meet some or all energy requirements for cooking, lighting and heating*. Energy for infotainment and mobility is deliberately excluded from this definition.

The definition of 'access to energy' includes the phrase 'is able to use' energy. In order to be able to use energy, it has to be available, and must be affordable. The definition

13 (ibid.).

therefore assumes that energy is both available and affordable, although possibly in rudimentary quantities only.

The United Nations Secretary-General's Advisory Group on Energy and Climate Change has set a target for energy access, and recommends that access to energy be provided to all by 2030.[14] Today it is widely accepted that access to energy can no longer be considered a luxury, but is an economic necessity and a key enabler to lift people out of poverty and improve living conditions to satisfy basic human needs. Indeed, access to energy is also increasingly understood to be a moral imperative.

However, it is also noted that while access to energy is undoubtedly a key enabler for development, the mere provision of energy is insufficient to eradicate poverty or bring about socioeconomic upliftment. As such, energy is a necessary but insufficient condition for development; it is a vital but not sole ingredient for advancement. And it is recognised that poverty is more than not having access to energy. Eradicating or at least alleviating poverty therefore necessitates ingredients other than providing tangible access to energy.

Poverty is reduced when people become increasingly able to afford the necessities of life. This implies that the deliberate creation of opportunities for additional income generation is key to addressing poverty. By generating more earnings and creating more desirable livelihoods, people have more options when deciding what they consider to be their most important needs, and how these can best be met. We all need energy for survival, even if we do not consciously choose a specific form of energy. In order to meet even elementary requirements for cooking, lighting, entertainment, information and heating, energy is always required. And this is why access to energy and having a good understanding of how access is determined by its availability and affordability is important.

Meeting basic energy needs is often accomplished by using several forms of energy, i.e. an energy mix. For example, to meet our lighting needs, we may need an energy source that is different from the one we need to meet our cooking needs. Most end-users are interested in a particular energy service or utility, rather than a specific energy form. Therefore, an energy ladder is presented in Figure 7 which identifies relevant energy services that provide energy for cooking, lighting, communication, entertainment and information, refrigeration, cooling, appliance use, and possibly a variety of productive purposes.

14 UN (2010).

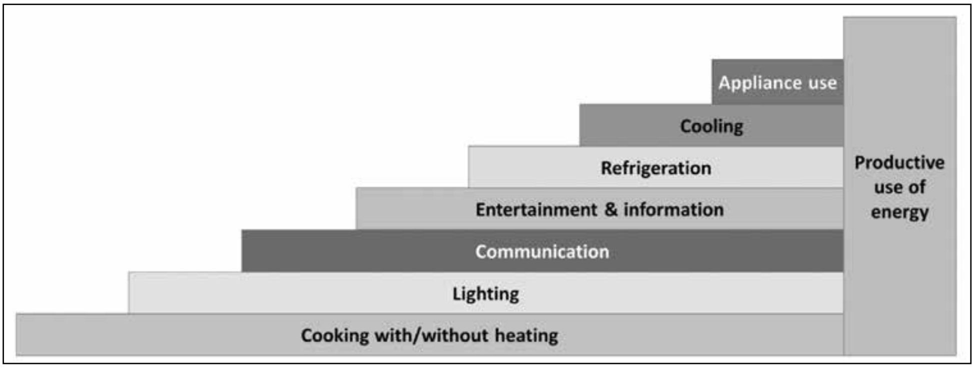

Figure 7: Energy services, from the most basic to those addressing modern needs
Source: Von Oertzen (2015b).

Basic access to modern energy services does not necessitate access to grid electricity. Indeed, only the top rungs of the energy ladder make it advantageous to have access to electricity. In addition, electricity does not necessarily have to be provided by the grid as there are an increasing number of alternatives to grid-supplied electricity, which can either augment or even fully replace grid services. However, the financial viability of grid augmentation or grid replacement is highly context-dependent and is best ascertained for each case.

For each of the rungs of the energy ladder, modern energy service technologies exist that enable end-users to meet their energy requirements, both with and without access to grid electricity. Often it is advantageous to use an energy mix that meets the entire supply requirement as cost-effective as possible. Examples include the use of modern energy fuels, such as liquid petroleum gas for cooking, or the use of energy efficient appliances such as modern fuel-efficient wood stoves instead of the more traditional uses of fire wood, and high-efficiency electrical lighting instead of candles.

In view of the energy ladder shown above, how can REEE-powering of Namibia's domestic sector be achieved? An aspirational definition of the deliberate REEE-powering of Namibia's domestic use of energy could be: "REEE-powering the domestic use of energy in Namibia is the deliberate process, supported by relevant policies and regulatory provisions, by which modern energy and energy-efficient technologies are available at prices that allow the country's citizens to meet their energy requirements in a socially acceptable and environmentally sound manner, while incentivising productive uses of energy that promote both individual and societal development".

REEE-powering the domestic use of energy should therefore follow an energy access ladder that first enables end-users to meet their most basic energy needs, and then incentivises the rapid uptake of energy-efficient technologies and the switching to clean energy sources. Such a deliberate progression assists in poverty alleviation, by creating enhanced living conditions that are a pre-condition for any meaningful participation in the country's development.

The definition above includes deliberate and specific references to economic, social and environmental aspects, as well as a perspective on the productive uses of energy as a catalyst for individual and societal development. We suggest that this definition for REEE-powering of the domestic use of energy can serve as a Namibian vision of how access to modern energy is to power national development in future.

4 REEE-Powering Commerce and Industry

Large- and small-scale commercial and industrial actors provide a multitude of services, including those involving the conversion of raw materials into goods, products and services. In this way, commerce and industry create jobs and supply the lubricant to the country's economy. It is evident that neither government nor the traditional providers of jobs, such as the agricultural sector, create as many new job opportunities as are potentially locked in commerce and industry, including at the scale of small and medium enterprises. Therefore, if long-term jobs are to be created in Namibia, these are likely to be in commerce and industry.

Namibia's Vision 2030 envisages the creation of an industrialised country.[15] There is little specificity as to how the most fundamental input commodities, such as water and energy, are to be provided to enable the intended development. This paper identifies some energy-related issues that will have to be addressed to ensure that the energy requirements of a partially industrialised country can be met in future. We therefore focus on how individual commercial and industrial actors may opt to address their energy needs in the years to come.

Developing the commercial and industrial sectors requires several energy-related inputs, such as fossil fuels and their derivatives, electricity and possibly biomass and biofuels. The type and scale of the industrialisation effort determines the variety of energy feedstock that has to be provided. While electricity demand can be significantly managed through the introduction of energy-efficient processes and the rigorous application of energy-efficient practices, the total energy requirement can generally not be eliminated through the application of energy-efficiency improvements alone. This emphasises the importance of having access to a secure and cost-effective energy mix. Modern energy requirements are changing, and the deliberate switching of fuels is a common practice in industry. It can result in the significant reduction of import dependencies and uncontrollable future costs.

Possible pathways in which REEE-powering can be achieved in commerce and industry include:

- replacing lighting, air conditioning, electric motors and related equipment and machinery with their modern energy-efficient equivalents;
- shifting electric loads from peak demand into off-peak periods, and using local generation to reduce the reliance on the grid;
- using solar thermal systems in favour of electric and fossil fuel-powered

15 GRN (2004).

heating systems, especially for water and process heat as used in commerce and industry;

- using biomass and biomass-related products to displace liquid and solid fossil fuels used in heaters, ovens, kilns and similar devices;
- using electrical instead of fossil-fuelled engines, which enhances the application of EE appliances and the use of RE generation technologies;
- diversifying the energy supply mix for energy-intensive plants and equipment to reduce the dependency on fossil fuels, while tapping into the array of modern renewable technologies, including biomass and solar;
- applying energy-efficient processes to reduce operating costs and the dependency on fossil fuels and grid supplies;
- enhancing interactions between commerce and industry and local electricity distribution entities through smart-grid technologies and distributed generation capacities, thus enhancing the scale and scope of demand response participation and increasing the use of RE generation options;
- creating national incentives to invest in energy-efficient and distributed generation technologies used in commercial and industrial plants – to reduce peak demand, to deliberately enhance the sectors' efficiencies and to ensure the dedicated application of carbon taxes for environmental enhancements; and
- emphasising EE and RE technologies in the promotion and marketing of Namibian goods and services, to capitalise on the clean and sustainable manner in which these were produced and how such use is supported by Namibia's rich natural endowments in renewable energy sources.

Commerce and industry can exert a market pull, and in this way incentivise the development and technology deployment along various supply chains. In this way, these actors play a pivotal role in preparing, trialling, showcasing and marketing their experiences when embarking on a journey of deliberately using renewable energy and energy-efficient technologies, thereby encouraging others to replicate REEE-powering efforts.

Access to cost-effective energy technologies is and will remain essential for all businesses. Finance has long been a barrier to more readily ensuring that access to technologies is optimised. While established electricity distribution entities operate under regulatory protection in Namibia, companies deciding to invest in energy efficiency or augmenting their energy supply by investing in own generation sources do not have such regulatory protection. Here, the finance sector plays a pivotal role. As such, it is often the perceptions and experience of local financing institutions that decide whether a particular technology transition is considered realistic or whether it should be largely blocked.

In Namibia, conventional providers of funding to commercial and industrial entities are not particularly well known for their technological nous, nor have they exhibited significant forward-thinking or courage to go beyond 'green-washing' their marketing efforts, and in some cases, their company logos. However, technological progress hinges on having access to financial services and products that enable the uptake of plants and equipment that bring about efficiency improvements and cost reductions, similar to those that energy-efficient technologies and select renewable energy generation options readily offer. In this regard, most providers of commercial loans would benefit from updating their in-house understanding of REEE technologies, and to get up to speed with the multitude of advances that are radically reshaping the energy-efficiency and renewable energy sectors in recent times.

The deliberate inclusion of energy-efficiency and renewable energy targets contributes to the marketing of Namibian goods and services, over and above the actual social, economic and environmental benefits associated with the use of energy-efficient technologies and contemporary renewable energy plants. No doubt, Namibia's commercial and industrial standing would improve if goods and services are deliberately produced using clean and sustainable energy sources which optimise the country's many natural endowments and create local sustainable jobs.

5 REEE-Powering Namibia's Electricity Utilities

5.1 Electricity Distributors

The future of Namibian electricity distributors is uncertain. The viability of current distribution businesses, in particular, rests on regulatory provisions and protection, and is underpinned by an increasingly outdated approach to service provision. While a considerable number of potential end-users exist that are not served by the grid, those that are connected to the grid have more choices to reduce their demand and meet their own energy requirements than ever before. This exposes the electricity distribution business to innovative and affordable end-user technologies that are bound to change the way in which they do business. For now, it remains uncertain where the journey will ultimately go.

Potential development pathways for the country's electricity distributors include:

1. distributors becoming overwhelmed by having to provide services to a rapidly increasing group of customers with low or very low consumption while seeing high-value clients reduce their demand, or defect from the grid;
2. distributors continuing to supply electrical energy to end-users, if and when available, but not taking proactive steps to meet the challenges of the future. These include the rising cost of grid-supplied electricity, and questions in regard to the security of grid supplies. At the same time, rapid rural-to-urban migration leads to an increasing number of unserved end-users in urban areas, as can be seen across Namibia today. Rapid urbanisation requires investments in additional infrastructure, while the expansion of services necessitates greater

maintenance and more rapid grid modernisation. All this incurs additional costs. Increased expenses for grid infrastructure however lead to increasing tariffs, which are already escalating at or near double-digit rates every year, which prices electricity out of reach of low-income off-takers, and incentivises high-end customers to shield themselves from such cost escalations by investing in energy efficient and electricity generation technologies.

3. distributors changing their approach of being mere suppliers of electricity to becoming energy-related service providers and facilitators. Such future services may include generating electricity, or taking supplies from local generators. Other energy-related services may focus on providing energy-efficient technologies to end-users. New services are likely to lead to a shift in the focus of distributors, from supplying electrical energy which is sourced centrally, to supplying grid connectivity services that optimise local generation, include utility-scale storage and facilitate trading opportunities between grid customers, while offering cost-competitive electricity to consumers.

Which of the scenarios listed above is likely to best describe the future of Namibia's electricity distribution industry? Here it is useful to identify those forces and reactions that will most likely shape the future of the sector as a whole. Systemic sector-wide forces of change are likely to include escalating end-user electricity prices; an increasing number of choices that high-end consumers have in regard to when and how much electricity they will demand; ever-increasing opportunities to reduce the consumption of grid-supplied electricity, or even defect from the grid; a significant increase of the number of small-scale grid users, who may only occasionally make use of grid services, while at the same time necessitating considerable grid extensions and therefore costly infrastructure investments; and a steady decline of the consumption patterns of high-end grid users in particular, as a result of measures taken to complement or augment their grid-supplied electricity requirements.

Today, as a result of the regulation of the Namibian electricity distribution sector, entities responsible for the distribution and supply of electricity are able to recover the costs associated with such services while earning a regulated return on the assets they apply. The role of distributors is to supply electricity using the distribution grid. They provide grid services.

Figure 8 illustrates the traditional relationship between distributors and their customers: distributors provide the infrastructure to supply electrical energy to end-users, while end-users pay for the energy consumed and the use of distribution assets. In an environment of little technical advancement and with a steadily growing number of consumption levels and consumers, this business model is self-preserving and would likely be long-lived. However, neither the context nor the business environment in which distributors operate today will remain unchanged. Indeed, technological advancements have a profound impact on how, when and how much future electricity consumers will rely on grid-supplied services.

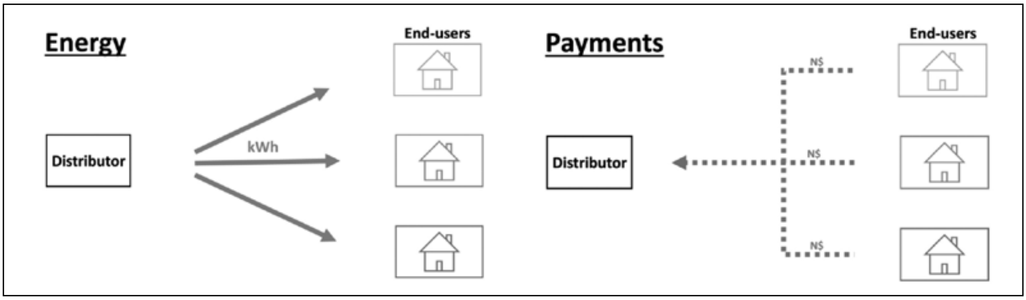

Figure 8: Traditional relationship between an electricity distributor and its customers
Source: Von Oertzen (2015b).

In Namibia, more than one-half of the country's population remain without access to electricity. At the same time, the pace of rural-to-urban migration and urbanisation is increasing. This exerts pressure on electricity distributors, and requires them to increase the rate at which new end-users are electrified. The increasing number of end-users wishing to benefit from grid electricity stand in contrast to the decline of consumption of high-value clients. Such end-users have begun to invest in their own electricity-generating capacity and contemporary energy-efficient technologies to cap their exposure to the steadily rising cost of electricity supplies. This state of affairs can potentially develop into a vicious circle for distribution entities, i.e. the so-called utility spiral of death. Namibia's electricity distributors and the business models that underlie their operations are not considered sufficiently robust to cope with these challenges, and developments are likely to undermine the core of their operations.

In view of these factors one could be tempted to assume that distributors have little choice and can only embark on a road of steady decline, as described above. While this may well be the fate of some distributors, it does not have to be that way. It is considered likely that distributors that are proactively re-shaping their business models explicitly to take the impacts of distributed generation and energy efficiency into account will successfully emerge as electricity service providers of the future. Such service bundles are directly linked to the presence of the distribution grid, i.e. can be provided through and by way of the grid. Today, distributors supply electrical energy by way of the grid. While this may not change very much, it seems likely that distributors of the future will increasingly include other energy-related services in their service bouquets and, in this way, REEE-power their operations.

The business models of future electricity distributors are likely to include the following:

- sourcing electrical energy from prosumers and from local generators that feeds directly into the distributor network, for re-distribution, in addition to sourcing electricity from NamPower as is currently done;
- facilitating services through the distribution grid, such as the transfer of electrical energy between local generators and prosumers;

- providing support services to end-users, thereby enabling consumers to use the grid to feed in and draw electrical energy while remaining a grid customer; and
- facilitating energy-related services as demanded by clients, for example through local service provision partners, when such services are demanded.

Most services that a REEE-powered distributor of the future will offer will be new, and will quite likely differ substantially from those that are currently offered. Such offerings necessitate closer relationships with clients, requiring sophisticated communications and interactions with clients. The business practices of most contemporary distributors do not include a personalised focus on how customers can optimally benefit from services. The business sphere is characterised by the absence of competition, and a lack of choice. Customers have no option other than to accept the tariffs and service offerings made available by the particular distributor that is operating in a given geographic area.

A REEE-powered future is likely to be very different from the present. From the point of view of distributors, embarking on a road of enhanced value-added service provision implies having to supply electricity, as is currently done, in addition to facilitating and/or offering energy-related services, either directly or in close collaboration with service partners. Depending on their individual viability, new services may include buying of electrical energy from clients, and re-distributing such energy to other clients, providing energy-related technologies, financing and maintenance services. Such service offerings may seem absurd, as they include new and potentially risky activities for which most of the country's distribution utilities are not geared. However, the traditional business model of Namibian distribution entities is under threat, and will undergo dramatic changes in the years to come. Yesteryear's revenue models will be undermined and disappear. New perspectives need to be created.

The business model of tomorrow's electricity distributor is likely to see the establishment of a multi-layered set of relationships between the distributor, its clients and various other service partners that a distributor engages, as is schematically depicted in Figure 9.

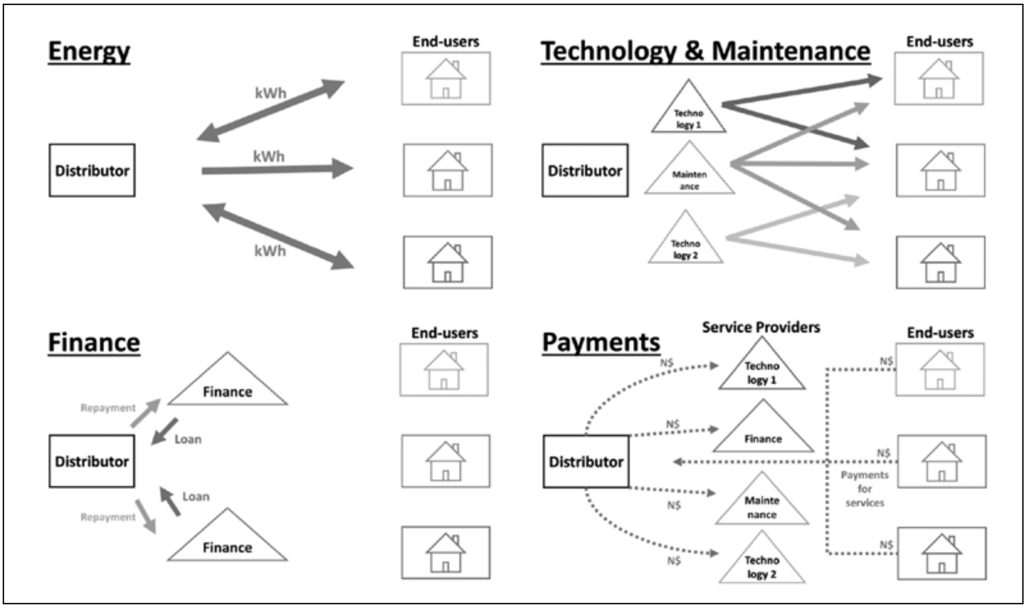

Figure 9: REEE-powered relationships between distributor, service providers and end-users
Source: Von Oertzen (2015b).

From the perspective of Namibian electricity distributors, broadening the electricity sourcing options, while extending service offerings, may be one of the very few strategies to strengthen the revenue base in future. These are likely to come under increasing pressure as highly efficient appliances become affordable, while the rapid uptake of grid-connected solar PV substantially reduces the electricity requirements of select end-users. And while it seems unlikely that substantial numbers of end-users will decide to defect from the grid, technical progress and the rapid reduction of energy storage prices make such scenarios more likely than at any time in the past.

By leveraging the access to end-users, distributors may be able to re-shape their service offerings, from the traditional sale of electricity, to become providers of energy-related services. Such a transition is not trivial, and necessitates that distributors become market savvy, and operationally efficient. These are not traits that the natural monopoly position in which Namibian electricity distributors find themselves has honed. But they are essential to developing competitive future energy service offerings that stand a chance of securing the longer-term viability of distributors. And it could be the only real chance that distributors have if the energy consumers' appetite for innovation and the pace of technological advancement in the electricity sphere are anything to go by.

5.2 REEE-powering Namibia by Independent Power Producers

Independent Power Producers (IPPs) can make a profound contribution to REEE-powering Namibia, and in this way contributing to energy security, the diversification of the energy mix, and – very important – the creation of local jobs and the strengthening of the local economy.

IPPs are not limited to renewable energy generation only. However, Namibia's current energy sector structure would seem to offer greater opportunities for small- and medium-sized IPPs, which could benefit from Namibia's considerable renewable energy endowments, including those locked in the country's abundant solar, wind and biomass sectors.

The creation of more investor-friendly framework conditions offering specific IPP targets, tariffs and tax incentives and offering greater transparency in regard to how IPPs are protected against changes in the country's policy, legal and regulatory environment will enhance Namibia's ability to attract new actors to the energy sector. Almost all countries in southern Africa seek investments in their energy sectors. Countries offering the best investment conditions are going to be more successful in attracting such investors than those where conditions remain uncertain or unattractive.

The South African approach to attract power sector investments is clearly not applicable in its totality to the much smaller Namibian energy sector, but still offers valuable lessons, in particular in regard to how the process is benefiting from a competitive system of price bidding. For Namibia it would seem appropriate to take cognisance of some of the regional lessons to place private investments in the energy sector on a more secure and results-oriented footing. In particular, a transparent system of project procurement will be necessary, and should create entry points for both solicited and unsolicited projects, provided they have merit. This is not currently the case in Namibia, and calls for much greater controls to safeguard the common public good and minimise corrupt practices by well-connected individuals.

In order to address some of the uncertainties expressed by IPPs wishing to do business in Namibia, government should codify guidelines that address the state's intentions in regard to IPPs. Spelling out energy targets, tariffs, tax breaks and other conditions and incentives, as well as the protection regime in case of policy, legal or regulatory changes, would go a long way to clarify the realities of investing in Namibia's energy sector.

As for specific financial framework conditions, it seems advantageous to incentivise the establishment of a number of smaller IPPs, rather than a few larger ones. Such an approach will better spread the risks and benefits of such investments, and create additional local investment opportunities. Funding for IPPs that originate locally does not require foreign exchange hedging, creates local opportunities, and allows for local value creation through the active recirculation of funds generated in Namibia.

5.3 REEE-Powering NamPower

NamPower is Namibia's national electricity utility, and is a 100% state-owned enterprise. In mid-2015, the installed electricity generation capacity that is owned and operated by the utility is mostly unable to supply the country's base load demand and does not meet peak requirements.[16] What is not supplied from local sources has to be imported. In the past years, imports have consistently increased, and now exceed 60% of the total annual electricity requirements.

Southern African countries have been slow to invest in new power generation capacities, and even slower to complete projects that have been in the pipeline for a long time. Today, the subregion suffers from a severe power shortage, with widespread negative impacts across the economies of the subcontinent. While regional energy ministers meet regularly, and utilities spend a fortune on planning for expansions, most countries in southern Africa cannot show that tangible progress is made in expanding their fleet of power-generating capabilities.[17]

At the same time, and in part as a direct result of load shedding becoming a daily disruptive reality for millions of consumers across southern Africa, a significant yet largely silent development is becoming more evident and will shape the business environment of tomorrow's electricity companies, including that of NamPower.

The following forces of change will critically affect NamPower's future:

1. Electricity end-users, irrespective of whether they are large power users or modest domestic electricity consumers, have an ever-increasing array of affordable technologies at their disposal to dramatically change the way that electricity is generated and consumed. In particular, distributed renewable energy generation, energy storage and energy-efficient end-use technologies re-shape the very way in which consumers will increasingly meet their daily electricity needs.

   Such a transformation is only accelerated if utilities cannot meet their traditional responsibilities, and end-users decide to take matters into their own hands. And because such end-user decisions are becoming more accessible and financially viable, yesteryear's client bases on which utilities shaped their service offerings may have reduced their grid dependence, or may have disappeared completely by the time that utilities have finally addressed the core supply problems. REEE-powering, in all its facets, is a game-changer that electricity utilities cannot afford to ignore.

2. A wealth of demand-changing technologies, ranging from distributed generation technologies to smart appliances and control technologies, are entering the consumptive space. This is happening at a pace and on a scale that has not been witnessed before, and enables direct interactions between utilities and their customers. In this way, instantaneous electricity demand patterns and hourly and daily load profiles can be changed at a flick of a button, thereby balancing the multitude of requirements of distributed generation sources, customer-specific demand response capabilities, and the composition of the national energy mix.

   Tomorrow's demand response capabilities completely re-shape the way in which

16 NamPower (2015).

17 Southern African Power Pool (2014).

utilities interact with their clients. Yesteryear's *top-down, you-consume-what-we-supply* relationship will change in favour of a state of play where electricity end-users are both consumers and producers, i.e. they will become *prosumers*. They consume electricity, and produce it, and interact with the utility as clients as well as end-users.

By granting access to some or all of their loads in order to facilitate the dynamic matching of demand and supply, clients help their utility to ensure the security of supply, hour by hour. Such mutual interactions are of benefit to all participants, as they allow the utility to use all available generation assets optimally and cost-effectively, irrespective of whether these are utility- or client-owned. In this way, the relationship between a modern-day electricity utility and its clients will be characterised by the synergies between them and their mutual dependency.

3. Depending on how the electricity regulator opens the electricity distribution and supply markets, a multitude of mostly small- and medium-scale supply opportunities can be created, in which end-users and entrepreneurs engage. This leads to a democratisation of the playing field, to the benefit of everyone.

   Allowing third-party interactions within the electricity supply industry, even if these were to be capped to generation scales below 5 MW capacity per generator, creates new investment and trade opportunities in a market that has largely remained locked out to private sector investments and engagement. While such market expansion may seem novel today, the deliberate opening of the electricity supply industry holds many advantages, including the creation of small- and medium-sized electricity sector actors and, with it, new business models and trade that has not been available in the past. By opening the market for direct participation, the country's electricity utilities which have previously been locked into a space devoid of competition begin to meet their peers, and compete for clients. In this way, REEE-powering Namibia creates a new supply environment in which the end-users have greater choices, and can actively participate when and with whom they believe they can make it happen, thereby unfreezing investments and shaking up encrusted structures that have mostly survived because of regulatory protection.

NamPower's future roles and responsibilities are a direct result of changing consumer requirements, and the increasing array of interactive technologies that become available. Sophisticated control systems will enable the utility to interact directly with its customers, and manage their generation capacity and optimise the load by way of direct customer demand response and load control measures. Such close interactions with end-users are radically different from those of today: as consumers become prosumers, utility management is likely to include the traditional control of generation sources and the grid, in addition to managing loads remotely and generating capacities made available by its clients. This is the face of an interactive future in the electricity sector, as is illustrated in Figure 10.

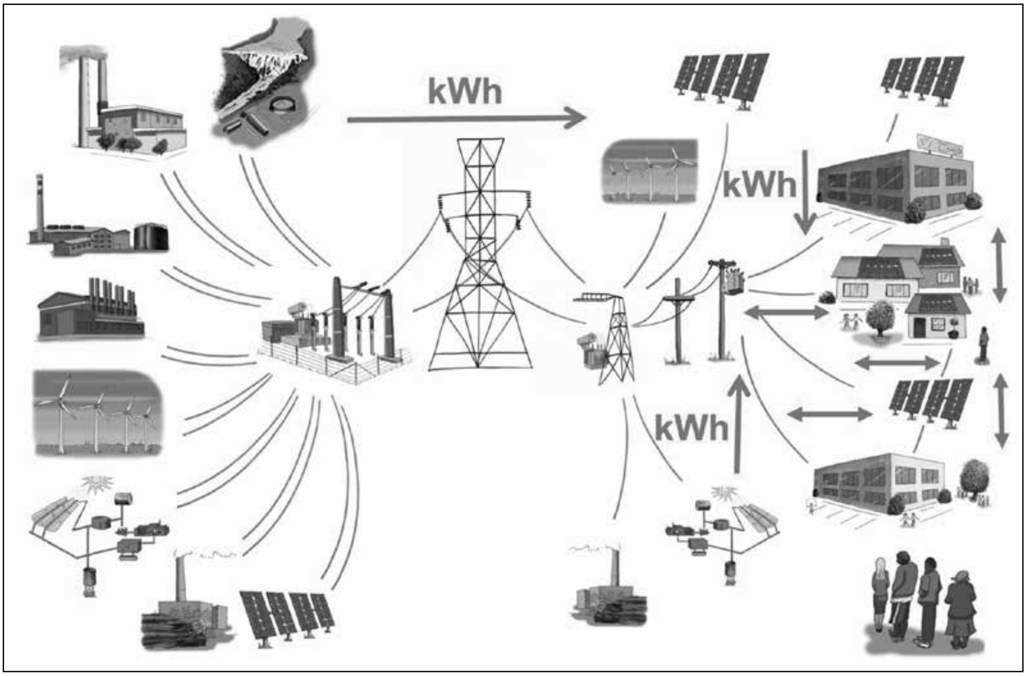

Figure 10: Energy exchanges in Namibia's REEE-powered electricity future
Source: Von Oertzen (2015b).

Namibia has some excellent energy resource endowments, not only in the solar, biomass and wind sectors, but also in the form of hydro-potential in the Kunene and Orange Rivers, as well as the natural gas resource of the Kudu gas field. However, neither the envisaged Kudu gas-to-power plant, nor the Baynes hydro-electric power plant in the Kunene River are located close to areas where any significant electricity consumption takes place. Therefore, what is generated has to be transmitted, necessitating substantial additional investments in high-voltage transmission infrastructure, which adds to the overall costs as well as to line losses.

It is also noted that the addition of a single large power plant, such as the envisaged Kudu gas-to-power plant, increases the overall riskiness of the country's electricity supply. This is because a country's energy mix is most resilient to external shocks and changes if several of its generation assets can be taken out of service without affecting its security of supply. This is not possible if there are either too few generation assets in the mix, as is currently the case in Namibia, or if the individual plants are too large to be taken out of the mix, as will be the case should the Kudu project be realised.

In contrast, small- and medium-sized generation assets located at or close to where the consumption takes place save on investments in transmission infrastructure. At the same time, such plants reduce line losses, and strengthen the diversity of supply. Even if a few small- or medium-sized plants are out of action, there will still be other generation assets in the mix which will continue to provide service. This reduces the overall supply risk. These factors will increasingly tip the viability scale in favour of small-scale distributed generation capacity, as will characterise Namibia's REEE-powered future.

In order to embark on a REEE-powered road to the future, NamPower's value proposition to end-users must be re-defined. In the past it was sufficient to provide electricity, tomorrow it is the service-oriented utility that survives because it offers end-user services despite most customers wishing to reduce their energy-related expenses and grid-reliance by REEE-powering. A new service orientation necessitates client-specific engagements that deliver a suite of products and services that REEE-powered clients demand. For example, through an energy supply contract, NamPower could on-sell electricity while at the same time benefiting from investments in generation technology made by the client, plus access to the client's loads. In this way, a synergistic relationship between the utility and its clients can see rewards for participating end-users, by driving down their electricity costs, while allowing the utility to generate income through the re-sale of electricity that is generated in off-balance-sheet generation assets, plus the active demand control of some or all of its clients' critical loads. This is of benefit to the utility, as well as its clients. And it leads to new business ventures, as the utility and its clients recognise value in continuing their mutual dependency.

The provision of reliable low-cost grid-tied services is a key value consideration that determines whether NamPower survives in a REEE-powered future. A future-oriented utility business model must also enable clients to benefit from their investments in REEE technologies, while at the same time continuing to use grid services. Such a service and value orientation is not a given. REEE-powering Namibia changes the playing field – for everyone.

NamPower is in a unique position to embrace and apply many contemporary technology advances, including in the field of RE, EE, storage and demand response management. The utility can therefore create additional value for its clients which they may not be able to realise on their own. And in this way, REEE-powering NamPower offers a long-term proposition to safeguard Namibia's investments in generation, transmission and distribution infrastructure.

The utility's future will, to a large degree, be determined by how it succeeds in integrating its services with the needs of its clients. This necessitates closer integration and deeper operational involvement in the affairs of the country's electricity distributors, to ensure that the multiple challenges faced by these last-mile suppliers can be managed in a way that places Namibia's formal electricity supply and distribution sectors on a firm future-oriented footing.

REEE-powering implies the deliberate creation of opportunities that leverage Namibia's considerable natural renewable energy endowments, and matching these to modern end-user aspirations, so as to ensure energy security while offering a clean and affordable electricity future for all. This is the national value contribution that NamPower must make.

6 Conclusion

This chapter illustrates how the deliberate integration of renewable energy, energy storage and energy-efficient technologies – i.e. the REEE-powering of Namibia – can be achieved.

Overall, REEE-powering is desirable because it is a decision in favour of using clean, sustainable and locally abundant renewable energy resources, as well as applying energy storage and energy-efficient technologies to reduce electricity consumption, where viable. Large-scale REEE-powering can be readily achieved today and, in many cases, the cost associated with such a transition is quickly recovered through savings.

There are many good reasons why Namibia ought to embark on a road of greater sustainability in energy. For one, the country's energy sector is highly import-dependent, and therefore remains extremely vulnerable. Indeed, Namibia imports all liquid fuels, while more than 60% of the country's electricity is imported. This dependency constitutes a permanent drain on the economy, as it necessitates currency outflows amounting to many billions of Namibian dollars every year. Funds leaving Namibia are not available to create local jobs, or to lift Namibians out of poverty, or to power local development. This is clearly undesirable.

The systematic application and use of renewable energies and the uptake of energy storage and energy-efficiency opportunities create local value in the social, economic and environmental spheres. The choice for REEE-powering is therefore also a choice for local value creation, and against the continued export of value and opportunities. Namibia's energy sector, in its current form, exports opportunities, and thereby limits local growth and development. But the design of the country's energy sector can be changed, and this is what REEE-powering is all about.

REEE-powering creates local value. Social value is enhanced when local jobs create local income opportunities and new local capacities, which strengthen the country's social fabric. Economic value is created through cost savings from locally generated electricity, per unit of energy saved through efficiency enhancements, improved local circulation of funds through local investments, and local income generation, as well as through taxes from local jobs and new business activities that bring about local value addition, and reduced currency outflows and foreign exchange exposure. And environmental value is created by reducing greenhouse gas emissions, saving water in the electricity sector, and reducing the environmental footprint through a reduced dependence on fossil fuels.

REEE-powering also addresses important strategic considerations, such as the enhancement of the security of supply of energy, reducing the country's vulnerability to foreign exchange dependency and the whims of foreign exchange fluctuations, and enhancing the country's resilience against the impacts of climate change by strengthening the local economy.

Namibia's present-day energy supply system delivers a variety of products, including liquid fuels, electricity, coal and others. However, the energy sector can be much more than a mere set of supply arrangements. Indeed, the energy sector can become a development engine, a locomotive for local value creation. But the machinery to realise such a vision must first be created. It requires new perspectives on how the more than half of all Namibians who remain without access to modern energy can effectively be included in the country's economy; how commercial and industrial actors can be weaned of their dependence on fossil fuels and imported electricity; and how electricity distributors, independent power producers and the national electricity utility can more deliberately benefit from recent REEE technology developments and begin actively to drive national development efforts.

This paper described the concepts for REEE-powering Namibia. They rest on the premise that national development is significantly enhanced when local strengths, such as our national renewable resource endowments, are put to deliberate use. By REEE-powering Namibia's domestic, commercial, industrial and utility landscape, each of these actors is likely to become an active driver of the national development engine. And in this way, Namibia can leverage its renewable energy resources to energise national development in all its facets. Not in a decade or two, but starting today.

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SECTION II:
REGULATORY PATHWAYS

6.
THE PATHWAY TO ENERGY LIBERATION IN NIGERIA: LESSONS FOR NAMIBIA

Yemi Oke

1 Introduction

Energy security poses a major challenge to socioeconomic development in Namibia and Nigeria. The need to ensure the optimisation of energy demand and supply is a crucial imperative for the survival of these two African countries. The imperative of energy security as a prerequisite for economic growth and development is widely acknowledged by experts and scholars.[1] While Nigeria seems to have devised the necessary legal and institutional frameworks for dealing with its energy challenges,[2] Namibia appears yet to have to come to terms with her threatening energy situation, given the nature of energy governance patterns that currently exist in the country. Desired attention has yet to be given by Namibia to sustainable energy security through progressive, investor-friendly, legal, regulatory and institutional frameworks to stimulate foreign and local investment in the sector – as was done in Nigeria a few years ago.

Since independence in 1990, the Namibian parliament has passed various statutes "to meet the needs and aspirations of the people of the country as well as provide a better future for all Namibians".[3] Securing a better future for Namibians might appear unrealistic without taking necessary, radical steps through law and policy to ensure energy security. Like other developing countries, Namibia is also currently being influenced by the inevitable and dynamic process and trends of globalisation.[4] This necessarily means that Namibia might be faced with difficulties in attracting the ever-competitive foreign (and sometimes local) investments in the power sector. This is a threat to its increasing population and the steady urbanisation taking place owing to the influx of people

1 See Sparrow et al. (1999). According to the trio, shortages of electricity are a severe constraint on economic growth and poverty alleviation in West Africa. The lack of electricity is often exacerbated by shortages of imported fuel, wood/charcoal, and other forms of energy. The high cost and unreliability of energy supplies area handicap for industrial development and employment generation, and also for poverty alleviation and public health. See also Oke (2012b:70).

2 See generally the Electric Power Sector Reform Act 2005 (the EPSR Act).

3 Hazel (2014:3).

4 Bösl (2014:6).

into the country from within and outside the African continent. This article assesses the current energy regime in Namibia amid the realities of growth and urbanisation. It observes that the country lacks discernible legal and regulatory frameworks for global competitiveness made possible through sustainable energy. It concludes by suggesting the need for drawing useful lessons from energy sector reforms in Nigeria for the purpose of dealing with present and future energy challenges in Namibia.

2 The Namibian Energy Regime

The Electricity Act of 2007 (the Electricity Act)[5] generally provides for the legal framework for power sector governance in Namibia, like the EPSR Act 2005 of Nigeria.[6] A major difference is that the former seeks to regulate, while the latter reforms and legitimises radical reforms introduced by the Nigerian government in the power sector. The Electricity Act of Namibia provides for the establishment of the Electricity Control Board (the Board)[7] as well as conditions for obtaining licences for the provision of electricity in the country.[8]

In Namibia, electricity may only be generated or distributed with due compliance with the requirements of laws relating to health, safety and environmental standards.[9] Similarly, when considering an application for the issue, renewal or amendment of a licence, the Board, acting on the authority of the Minister, gives due consideration to matters or activities which may adversely affect, or result in damage to the environment.[10] The applicant may be required to submit an environmental impact assessment study indicating the extent of any potential damage to or pollution of the environment and the steps proposed to be taken by the applicant to prevent or minimise such damage or pollution and to restore the environment.[11] The Nigerian regime makes similar provisions, except that environmental consideration is not stepped up as a major requirement for the renewal of licences, as is the case in Namibia.[12]

The provisions of the Electricity Act of Namibia appear inherently contradictory as far as the energy goals of the country are concerned. There is need, therefore, to balance policy objectives with legal and regulatory provisions, industry realities and stakeholders' expectations. Without mincing words, it can be said that the Namibian energy sector is in dire need of reforms by way of liberalisation and privatisation, when compared with other countries. Countries across the world have embraced liberalisation of electricity production. Experts have pointed out that energy reforms provide opportunities

5 See Electricity Act of Namibia, No. 4 of 2007.
6 EPSR Act, 2005, supra note 2.
7 Section 18(4)(b) of the Electricity Act of Namibia, supra note 5.
8 See Koep & Van den Berg (2013:192).
9 Section 18(4)(b).
10 Section 21(1).
11 Section 33(1)(a) of the Electricity Act of Namibia, supra note 5.
12 For the procedure for electricity licence in Nigeria, see generally section 70 of the ESPR Act, supra note 2.

which de-emphasise high carbon-emitting electricity sourcing.[13] Concerns about global warming caused by industrialisation and pollution have heightened the quest for decentralisation of energy options and liberalisation of electricity sectors across the world.[14]

The Namibian National Policy on Climate Change*, 2011,* also prioritises the need to enhance power generation capacity of the country in a manner that encourages sustainable energy and low carbon development.[15] To this extent, the policy suggests measures to support sustainable energy, as well as exploration of low carbon development, which entails promoting renewable forms of energy (wind, solar, biogas, etc.) to reduce green house gases (GHGs); formulating and enacting energy conservation legalisation and audit standards; promoting green technology, practices and standards; and ensuring reduction and control of harmful emissions through regulatory programmes.[16] According to the policy:

> Power capacity shortages experienced in the SADC region since 2007 suggest a looming energy crisis for southern Africa (Electricity Control Board 2006). In addition to complicating the huge challenge of electrification throughout the region, the energy crisis has cross-sector implications as energy and economic development are inextricably linked. Given the imminent, widespread threat of such a crisis, adaptation that accounts for the impact of climate change in the energy sector is a matter of highest urgency.[17]

Although energy efficiency and security are matters of "highest urgency" in Namibia as revealed in the quotation above, commensurate attention has yet to be given to this objective. NamPower, the state-owned utility company, still has a monopoly on generation, transmission, and import and export of electricity in Namibia.[18] The case was similar in Nigeria under the now defunct NEPA.[19] Namibia relies on imports for much of its electricity needs, as domestic production is highly seasonal, depending on the water level at the Ruacana hydroelectric station on the Kunene River.[20] Namibia's electricity imports are essentially sourced through Eskom of South Africa, and recently from the Hwange thermal plant in Zimbabwe under the power-purchase arrangement of April 2007 between Nampower and the Zimbabwe Electricity Supply Authority.[21] Clearly, this situation is unsustainable, making reforms a matter of necessity.

Energy sector reforms in Namibia must necessarily be holistic, and must be extended to cover allied sectors like gas and renewable energy sources. This is largely because

13 See the IEA (2010:5f.).

14 Varley (2006:20).

15 See Republic of Namibia, Ministry of Environment and Tourism, The Namibian National Policy on Climate Change, October 2011, para. 4.9 at page 18.

16 (ibid.:para 4.9 at pages 18–19).

17 (ibid.:para. 4.9).

18 Ruppel (2013:432).

19 The monopoly hitherto enjoyed by the erstwhile National Electric Power Authority (NEPA) for several decades was abrogated, as the new regime aims to liberalise the sector. See Oke (2013:10).

20 Ruppel (2013).

21 (ibid.).

the wave of electricity sector reforms across the globe has brought to bear the attendant practice of interconnected, multi-sectoral reforms to privatise, decentralise or deregulate allied sectors, like gas and others, whose activities impact on the performance of the electricity sector. This trend might also be inevitable in Namibia. In some countries, allied sectors are reformed before the electricity sector. For example, in the UK, British Gas was privatised prior to the electricity industry reform in England and Wales, although the country was at that time contending with an inefficient coal industry.[22] After its main industry reform had been completed, Chile experienced problems with its gas supply from Argentina, on which it was dependent, leading to decentralisation of its gas regime to boost electricity generation in the country.[23] The Russian case is probably one of the most difficult, as the gas supply industry is still a public monopoly.[24] This further underscores the prudence of effecting consequential reforms in allied sectors before or immediately after reforms in the power sector.

In Nigeria, reforms of the gas sector were embedded in the wholesale electric power sector reform policy and law. The liberalisation of the electric power sector has seen more thermal plants being built by the government through the National Integrated Power Project (NIPP), with the ultimate aim of injecting additional megawatts into the national grid. NIPP gas plants were strategically built to fast track gas supplies to enhance new generation capacity in the power mix.[25] These and other initiatives must be seriously weighed by Namibia as part of the overarching issues and considerations involved in energy sector reforms and its privatisation – as occurred in the case of Nigeria and is discussed below.

3 Comparative Overview of the Nigerian Energy Regime

The history of electricity in Nigeria dates back to 1896 when the country was under the colonial rule. Electricity was first produced in Ijora, Lagos, by the British colonial government.[26] The Nigerian Electricity Supply Company (NESCO) was later

22 Crow (2001:9).
23 Cooke (2013:11). See also Cooke (2011:25).
24 Cooke (2005b:14).
25 NIPP comprises power initiatives in the generation, transmission and distribution sectors meant to fast track capacity improvement in Nigeria's power industry. Funds for the projects were secured from the Excess Crude Oil account. The Niger Delta Power Holding Company (NDPHC), a corporation registered by law as a special intervention vehicle (SIV), was created to manage the massive investment into NIPP with an efficient private sector culture. NIPP was originally conceptualised to undertake mostly generation (gas-fired) projects, but had to stretch its ambit to include a wide range of transmission and distribution upgrade initiatives in order to address years of under-investment and the resultant capacity gaps in the sector. The NIPP initiative aims at utilising the abundance of Nigeria's gas as a fuel for power generation. See Nigeria Presidential Task force (undated).
26 Niger Power Review (1985:1–6).

established and commenced operations in 1929.[27] In 1946, the colonial government took over electricity governance by establishing the Public Works Department (PWD). PWD took over the responsibility of electricity supply in Lagos. Four years later, precisely in the year 1950, the Electricity Corporation of Nigeria (ECN) was created pursuant to the Electricity Corporation Ordinance of 1950,[28] while the Niger Dams Authority (NDA) was also established at about the same time by an act of parliament.[29]

Fusion of generation and transmission began formally in Nigeria on 1 April 1972, when amalgamation of the two existing organisations, namely the ECN and the NDA, was effected by a military decree[30] to form the National Electric Power Authority (NEPA). NEPA was exclusively responsible for generation and distribution of electricity in Nigeria, like NamPower of Namibia. Over about four decades, NEPA unsuccessfully managed electricity generation, transmission and distribution in Nigeria and was unbundled and divided into 18 new companies and semi-autonomous business units under the now dissolved initial holding company called the Power Holding Company of Nigeria (PHCN).[31]

The structure of electricity governance in Nigeria under the National Electric Power Authority (NEPA) is radically different from the regime of the EPSR Act.[32] A major difference is that the NEPA Act intended to underpin a wholly state-owned and government-controlled electricity sector in Nigeria.[33] NEPA however merely served as a statutory body to effect state monopoly in the sector.[34] The EPSR Act expressly provides for a liberalised regime of electricity to promote competition and a level playing field in the power sector. It embraces radical, private sector involvement by way of direct and indirect investments, including technical partnerships with the Nigerian government.[35] The new regime departs sharply from the old paradigm of state monopoly in electricity governance in Nigeria.[36]

27 See Electricity Ordinance Act of 1929.
28 See Electricity Corporation Ordinance No. 15 of 1950.
29 Manafa (1995:37–51).
30 See the National Electric Power Authority Decree No. 4 of 1972.
31 The commercialisation and privatisation regime had listed NEPA as one of the state enterprises to be commercialised. See the Commercialisation and Privatisation Decree No. 25, 1988.
32 See the National Electric Power Authority (NEPA) Act, Cap N 33, Laws of the Federation of Nigeria (LFN) 2004.
33 See Oke (2012b), (2011). See also Chigbue (2006).
34 See for example, sections 1 and 3 of the NEPA Act, supra note 32.
35 See Oke (2012a).
36 See sections 25, 26, 28, 29, and 82 of the EPSR Act, supra note 2. For example, sections 80 and 81 of the EPSR Act provide for consumer protection, and require high performance standards by the operators to engender maximum utility and safety to consumers of elec- tricity. Regrettably, section 27 of the repealed NEPA Act declares that NEPA is responsible for neither the safety of the consumers,nor for the efficiency or safety of the cables and appliances of consumers. Section 35 of the NEPA Act forbade any other

The Nigerian government has clearly set out huge but realisable targets for the power sector in the country. Highlights of Nigerian expectations in the power sector[37] include: a) ensuring a system of generation, transmission, distribution and marketing that is efficient, safe, affordable and cost-effective throughout the country; b) ensuring that the power sector attracts private investment both from Nigeria and from overseas; c) developing a transparent and effective regulatory framework for the power sector; and d) ensuring minimum adverse environmental impact.[38] Setting similar realistic and achievable goals is essential to guiding Namibia through the energy sector reform process.

Under Nigerian law, an electricity licence is regarded as a legal right granted by the Nigerian Electricity Regulatory Commission (NERC or Commission)[39] pursuant to the provisions of the Act[40] for the purpose of electricity transmission, distribution, operations, trading, and related activities. An electricity licence granted by NERC does not, however, confer exclusive rights to the licensee, as stated in section 71(6) of the Act.[41] The issue and essence of an electricity licence has also been decided in Re: An Application by Alliance Energy for Generation Licence,[42] where the Commission held that, in line with the objective of competitiveness of the electricity market, a licence does not confer the right of exclusivity. A licensee's right is only valid for ten years and is renewable at the pleasure of the Commission. Unless renewed, by necessary implication the licence automatically reverts to the government at the expiration of the period for which it is issued.

A licensee desiring renewal of his or her licence needs to apply to have the licence renewed before the expiration of the current term.[43] All the terms and conditions stipulated under section 71(1–11) apply *mutatis mutandis* to renewal of electricity licences.[44] To protect the right of reversion, the law provides that electricity licences may be amended by the

person or government agency from obtaining licences to operate power plants or generate electricity, in contradistinction with the level playing field, competitive structure under the EPSR Act of 2005.

37 BPE (2011).

38 (ibid.).

39 See section 31 of the EPSR Act, supra note 2, for the establishment of NERC.

40 According to section 100 of the Act, "licence" means a licence issued by the Commission under Part IV of the Act.

41 It states that: "Unless expressly indicated in the licence, the grant of a licence shall not hinder or restrict the grant of a licence to another person for a like purpose and, in the case of absence of such an express indication, *the licensee shall not claim any exclusivity*, provided that the Commission may allow a licensee activity to be exclusive for all or part of the period of the licence, for a specific purpose, for a geographical area, or for some combination of the foregoing" (*emphasis added*).

42 (Unreported). Case No.: NERC/CNO0306.

43 Section 72(1).

44 Subsection (3).

Commission on terms and conditions deemed appropriate,[45] or on conditions stipulated by the Act.[46] Transfer of a licence is expressly prohibited, unless in the manner excluded or exempted by the Act.[47] The provisions above, and others, in the Nigerian regime provide useful guides and lessons for Namibia towards energy sector reforms.

4 Lessons for Namibia

Some experts have pointed out the social dichotomy in the Namibian electricity industry. Demand for electricity among consumers is heavily weighted to a few large users and is expected to become further complicated in the future as electricity consumption is diverted from homes to industries and manufacturers.[48] The reasonable thing for Namibia to do is not to slow down electricity supplies to corporate concerns, regardless of whether supplies are domestic or imported. It is prudent for Namibia to increase electricity supply to accommodate development, and project for future growth. It is a recipe for crisis to sustain the current level of electricity generation in the country despite increasing demand for electricity by industries, businesses and homes.

Facts gathered from some of the renewable energy projects embarked upon indicate that energy for the future of the country is built around renewable sources.[49] A remarkable increase has been noticed in the number of renewable energy products in Namibia, particularly solar power. However, some opinion writers have cautioned against ambitious renewable energy proposals, arguing that some of the propositions for renewable energy production appear unrealistic or questionable when scrutinised for feasibility.[50] A cautionary approach has therefore been suggested regarding investors

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45 Electricity licences may be amended on the following grounds: (i) Where the licensee requests an amendment; (ii) Pursuant to the conditions stipulated in section 71(7) of the Act on modification of terms or conditions; (iii) Upon receiving a complaint from any consumer, eligible consumer, consumer associ- ation, association of eligible consumers, customers or other licensee; or (iv) On Commission's own initiative. See generally section 73(1)(a–d).

46 The law provides in section 73(2) that: (a) the applicant/licensee makes an application, (b) licensee causes a notice to be published of the proposed amendment to the licence in accordance with such directions as may be given by the Commission, (c) the publication must state the period within which objections and representations could be made in respect of the amendment, (d) the Commission shall not amend until all objections or representa- tions received have been considered and determined.

47 Section 69(1) provides: The Act provides: "A licensee shall not, except as provided in section 26(7), assign or cede his licence or transfer his undertaking, or any part thereof, by way of sale, mortgage, lease, exchange or otherwise without the prior consent of the Commission. Provided that, should the Commission determine that in any instance the circumstances so require, it may establish licence terms and conditions providing specific or general consent for any or all of the foregoing".

48 Ruppel (2013:433).

49 (ibid.).

50 *Etango Magazine* (2014:3).

coming with gigantic and ambitious project proposals with no practical benefit to Namibia.[51] Beyond deploying renewable energy sources, the experience of Nigeria in the quest for energy security through renewable and conventional sources indicates that the success of a power sector requires some operational and regulatory restructuring to bring about a socially sustainable and community-friendly electricity regime to instil confidence in the investors.[52]

Foreign investment in the energy sector is always a question of what will satisfy a particular investor, and whether the project will satisfy the requirement of 'bankability'[53] Electricity is a capital-intensive adventure. To attract investment finance in countries like Namibia and Nigeria entails certain idiosyncratic and factual considerations of the regulatory and operational environments. A number of sociopolitical considerations likewise determine the suitability, or otherwise, of making investment commitments in the electricity sector in certain countries. The investment atmosphere must be such as to be able to instil unflinching confidence in the investors that recouping the invested capital, with competitive yields, would not in any way be impeded. Several issues can affect bankability – a technical term denoting commercial expectations and assurances that an investor will recoup investment capital with freely transferable, attractive gains.

Certain assumptions like 'pollution haven' and 'regulatory chill', and the 'race-to-the-bottom' theory[54] along with other phenomena associated with competition[55] and foreign direct investment (FDI),[56] would appear to suggest that to attract investors in energy and allied sectors depends on how attractive the sector is in terms of incentives and ability to repatriate the invested funds with gains.[57] These propositions fail to amplify the role of the legal and regulatory frameworks as well as political and social atmospheres or other considerations. However, the general observation is that, in electricity or other energy resources endeavours, investors are wary of the booby trap incentives provided in the legislation to attract them to make investments. An average investor knows that investment is easier made than unmade. This means a piercing examination is needed of sometimes deceptive incentives to enable a careful consideration of the political, social and other factors that would make investing in a country a reasonable business decision.

51 (ibid.).

52 See Oke (2014).

53 Pritchard (2005:73).

54 See for example Johnston (1998:58); and Cohen (1996:154). But see and compare Wheeler (2001:5).

55 For detailed discussion and overview of literature on the issue of investment theories, see OECD (2002a).

56 See OECD (2002b:10–24) for detailed discourse and review of literature on the environmental and other benefits of FDI, which seems to justify foreign investment in natural resources, including mining.

57 See the Nigerian Investment Promotion Act, Cap N117 on incentive for foreign investment in Nigeria. For example, section 22 provides for unconditional transfer of funds through authorised agent while sections 22 and 25 respectively provide for incentives for special investments and guarantees against any expropriation.

It makes good business sense to invest in a politically stable and socially reliable country with no deceptive incentives. It is against commercial realities to embark on an irrational and expensive investment in the electricity sector in a turbulent and politically volatile atmosphere, camouflaged by distorted, woolly incentives.[58]

The controversies surrounding the Neckartal Dam project – the Neckartal is the biggest dam in Namibia – typify a volatile political and social atmosphere that could either instil or discourage investor confidence.[59] Like the Neckartal Dam project, the Gam energy project is a monumental project embarked upon by Namibia and is, arguably, one of Africa's largest off-grid solar plants.[60] The Rural Electricity Distribution Master Plan (REDMP) 2010 identified the Gam as an off-grid area which may not receive grid electricity within the foreseeable future, i.e. not for at least 20 years.[61] The Gam solar project therefore became a vital addition to the energy prosperity of Namibia through decentralised power generation, as an alternative to grid extension.[62] Intensive deployment of renewable electricity is part of the strategy of decentralised power generation to meet energy demand. It is widely believed that countries in the SADC region, particularly Namibia, are headed for a major energy crisis by the year 2016. This could be mitigated by decentralised energy strategies to create room for viable (renewable) energy projects like solar plants, wind farms, bush-gas, or a combination of these, across the nation.[63]

In another piece, the writer argued for the need for decentralised energy options (DEOPs) for Nigeria and other African countries like Namibia.[64] DEOPs centre around a holistic approach to a sustainable energy policy for the developing countries. It advocates decentralisation of the governance structure, multiplication of the means of production, availability of affordable options, and devolution of governance, control and management responsibilities.[65] The adoption of decentralised models has helped in the repositioning of energy resources sectors of several countries the world-over. The driving force varies from one country to another. In countries such as Kenya, the United Kingdom, and in Latin America, the privatisation of electricity provision has opened up a means of attracting funds from the private sector to relieve the burden of inadequate government funding and subsidisation in the electricity sector.[66] Beyond DEOPs, Namibia also needs to introduce certain regulatory and institutional reforms in the energy sector for overall efficiency and sustainability, as Nigeria has done.

58 (ibid.).
59 See Schmidt (2014:41).
60 *Etango Magazine* (2014:4).
61 (ibid.).
62 (ibid.).
63 von Gossler (2014:15).
64 Oke (2012b).
65 (ibid.).
66 (ibid.).

5 Some Regulatory and Institutional Imperatives for Namibia

Despite having some renewable energy sources, Namibia's current and future projected energy supply for domestic electricity generation is inadequate to meet both current and future projected energy demands of the country.[67] As it stands, between 35 and 60% of Namibia's electricity requirements are currently imported from the Southern African Power Pool (SAPP) through bilateral and day-ahead market contracts.[68] Compared to Nigeria, Namibia provides weak incentives for enhanced energy generation locally because of the low cost of imported electricity.[69] The construction of a new power plant has not been considered for the past 20 years in the country, while on-grid renewable energy projects have also proved unattractive to potential investors owing to local subsidies for power consumption. Subsidies make new private sector investment unrealistic and unattractive in the capital-intensive energy sector. Therefore, Namibia needs to put in place certain regulatory and institutional frameworks to create a level playing field for all stakeholders under a strong, efficient and effective sector regulator, like the one in Nigeria, to achieve energy security and sustainable electricity generation through conventional and renewable sources.

5.1 The Role of Electricity Regulator in Sustainable Electricity

In Nigeria, the burden of ensuring a competitive electric power sector through the enforcement of laid down regulations and law is vested in the Nigerian Electricity Regulatory Commission (NERC),[70] as sector regulator. The objectives of NERC include:(a) to create, promote and preserve efficient industry and market structures, and to ensure the optimal utilisation of resources for the provision of electricity services; (b) to maximise access to electricity services, by promoting and facilitating consumer connections to distribution systems in both rural and urban areas; (c) to ensure that an adequate supply of electricity is available to consumers; (d) to ensure that the prices charged by licensees are fair to consumers and are sufficient to allow the licensees to finance their activities and to allow for reasonable earnings for efficient operation; (e) to ensure the safety, security, reliability and quality of service in the production and delivery of electricity to consumers; (f) to ensure that regulation is fair and balanced for licensees, consumers, investors and other stakeholders; and (g) to present quarterly reports to the president and National Assembly on its activities.[71]

In carrying out its objectives, NERC also performs the following statutory functions: (a) promote competition and private sector participation, when and where feasible; (b) establish or, as the case may be, approve appropriate operating codes and safety,

67 Renkhoff (2013:201).

68 Out of the 3 767 GWh that were fed into the Namibian system in 2010, the South African power utility supplied 1 429 GWh, while NamPower generated only 1 305 GWh. (ibid.).

69 (ibid.).

70 See Section 31 of the EPSR Act, supra note 2.

71 (ibid.:Section 32(1)).

security, reliability, and quality standards; (c) establish appropriate consumer rights and obligations regarding the provision and use of electric services; (d) license and regulate persons engaged in the generation, transmission, system operation, distribution, and trading of electricity; (e) approve amendments to the market rules; (f) monitor the operation of the electricity market; and (g) undertake such other activities which are necessary to carry out or give effect to the objects of NERC.[72]

Beyond NamPower and the Ministry, a strong regulator is required by Namibia. A regulator is the engine room for effective operationalisation of sector law, regulations, rules and objectives. The electric power sector regulator manages and oversees the affairs and activities of the sector as the official watchdog of the industry. It carries out activities ranging from the issuance and renewal of licences and permits, electric company's operations, interaction with customers and compliance with sector or industry regulations. It also collects appropriate or statutory fees from sector operators and ensures that companies operate in line with established rules, regulations and procedures. In addition, an electric power sector regulator carries out oversight duties of reviewing service quality to meet or exceed established standards and ensures that electricity rates are appropriate for the quality of service without taking undue advantage of electricity consumers.

A strong and independent regulator of the electricity market is indispensable to effective electricity governance in Namibia. The role of NamPower as industry player should not be confused with that of a sector regulator or the Ministry, which provide administrative guides to the sector, like in Nigeria and other countries. Regulatory independence manifests in the ability of the regulator to carry out decisions without undue interference from the government or the market participants, thereby instilling confidence in the entire power sector. Attendant conflicts of interest could compromise the development, application and enforcement of system security rules, or undermine fair competition in the sector. This may lead to inertia, as competing interests lead to an inability to resolve rule-making issues in a timely or effective manner.[73] The independence of the energy sector regulator is crucial to the success of the privatisation process, as the experience of Nigeria has shown.

5.2 The Privatisation Processes

Namibia also needs to take a cue from Nigeria in the area of processes that led to privatisation of public electricity corporations. Pursuant to section 24 of the EPSR Act,[74] the National Council on Privatisation (NCP) commenced privatisation of the successor companies that are holders of generation licences, distribution licences or transmission licences, in accordance with the provisions of its enabling statute.[75] To this end, the

72 (ibid.:Section 32(2)).

73 Cooke (2005a:14).

74 EPSR Act, supra note 2.

75 See the Public Enterprises (Privatisation and Commercialisation) Act, Cap P 38, Laws of the Federation of Nigeria 2004 (Revised 2010).

NCP midwifed the privatisation of the generation and distribution successor companies (Gencos and Discos respectively) and, on 26 September 2012, five firms emerged as bid winners of the five Gencos out of six put up for sale by the federal government of Nigeria.[76] The six Gencos being privatised have various installed capacities as summarised below.[77] In the financial bidding process conducted by the NCP, Transcorp emerged as the preferred bidder for the Ugheli thermal power plant with an offer of $300m, to beat its closest rival, Amperion, which offered $252m. However, Amperion, which was the sole bidder for the Geregu power plant, matched the reserve bid price of $132m to emerge as winner of the Geregu power plant. CMEC/Eurafric Energy Consortium, on the other hand, emerged as the preferred bidder for the thermal power plant with an offer of $201m, while Mainstream Energy Solutions Limited emerged as winner of the Kainji hydro power plant being the sole bidder with an offer of $50,76m, which offer met the reserve annual fee fixed for the plant. The transaction is not an outright sale, but a 15-year concessionary arrangement with the bid winner paying a commencement fee of $257m before the deal can be sealed.[78] Similarly, North-South Power Company Limited emerged as the preferred bidder for the Shiroro hydro power plant, with a sole bid of $23,6m annually for a 15-year concession and payment of $111,65m as commencement fee to close the deal. However, no winner has emerged for the Afam Power plant, as the three bidders for the plant reportedly failed to comply or meet stipulated guidelines.[79] There are 11 electricity distribution companies, or Discos, in Nigeria, with various distribution capacities and peak load demands.[80] Following

76 The bid winners are Transnational Corporation of Nigeria Plc (Transcorp), Amperion Consortium, CMEC/Eurafric Energy Consortium, Mainstream Energy Solutions Limited and North-South Power Company Limited.

77 Installed capacities of the six Gencos are as follows: Ugheli Power Plc has only one plant: Ugheli power plant is situated in Delta State and has an installed capacity of 972 megawatts. Sapele Power Plc has only one plant:Sapele thermal power plant is situated in Delta State with an installed capacity of 1 020 megawatts. Afam Power Plc has only one plant: Afam power plant is situated in River State and has an installed capacity of 726 megawatts. Shiroro Hydro Plc has only one plant: Shiroro hydro power plant is situated in Niger State with an installed capacity of 600 megawatts. Geregu Power Plc has only one plant: known as the Ajaokuta power plant it is situated in Kogi State with an installed capacity of 414 megawatts. Kainji Hydro Power Plc, on the other hand, has two power plants: Kainji power plant situated in Niger State and Jebba power plant situated in Kwara State, with installed capacities of 760 megawatts and 540 megawatts respectively.

78 See generally MJS Partners (2012).

79 (ibid.).

80 The 11 Discos are as follows: Abuja Disco covers FCT, Nassarawa, Niger and Kogi States, with a distribution capacity of 515 megawatts and peak load demand of 835 megawatts. Benin Disco covers Edo, Delta, Ondo and Ekiti States, with a distribution capacity of 392 megawatts and peak load demand of 1 000 megawatts. Eko Disco covers the southern part of Lagos State, with a distribution capacity of 796 megawatts and peak load demand of 1 105 megawatts. Enugu Disco covers Anambra, Enugu, Abia, Imo and Ebonyi States, with a distribution capacity of 612 megawatts and peak load demand of 1 017 megawatts. Ibadan Disco covers Oyo, Ogun, Osun and Kwara States, with a distribution capacity of

the financial bid for the assets of Discos conducted by the NCP on 17 October 2012, Integrated Energy emerged as the preferred bidder for four out of the 10 distribution companies offered for sale. The four Discos are Yola, Ibadan, Eko and Ikeja. On the other hand, Chrome Energy won the bid for Abuja and Enugu, while Aura Energy, as sole bidder for the Jos Disco, won by default. Similarly 4-Power Consortium, as the sole bidder for the Port Harcourt Disco, won by default also, while Vigeo Power Consortium won the Benin Disco. Sahelian Energy won the bid for Kano Disco; but none of the bidders for the Kaduna Disco qualified on technical and financial grounds.[81] Earlier on, the management of the Transition Company of Nigeria (TCN), one of the successor companies, was transferred by way of concession to Manitoba Hydro International, with the federal government of Nigeria retaining 100% ownership. The Manitoba deal has subsequently become controversial owing to certain local factors and bureaucratic inconsistencies. These challenges had been predicted by the writer in another article well before they had arisen.[82] Fortunately, these have since been laid to rest. Given the experience of Nigeria, it is crucial for the Namibian government to implement privatisation appropriately and successfully, as any error could undermine the integrity of the process and thereby undermine the entire reform effort. The success of the process could also go a long way in determining subsequent flow of foreign investment in the power sector, as investors' confidence could be eroded by lapses in the privatisation exercise. This is the reason why Namibia should leave no stone unturned in avoiding the kind of ugly controversies that surrounded the Neckartal Dam project.[83] The dam project became the object of a contentious law suit in *CSC Neckartal Dam Joint Venture v Tender Board of Namibia & Others*.[84]

The tender for the construction of Nackartal, the biggest dam in Namibia, was awarded to the China Henan International Corporation on 16 December 2011. Five days later, on 21 December 2011, the decision was overturned at an emergency meeting of the Tender Board, and the tender was awarded to another bidder, namely Impreglio. The process

878 megawatts and peak load demand of 1 193 megawatts. Ikeja Disco covers the northern part of Lagos State, with a distribution capacity of 854 megawatts and peak load demand of 1 335 megawatts. Jos Disco covers Plateau, Bauchi, Gombe and Benue States, with a distribution capacity of 378 megawatts and peak load demand of 507 megawatts. Kaduna Disco covers Kaduna, Kebbi, Sokoto and Zamfara States, with a distribution capacity of 344 megawatts and peak load demand of 520 megawatts. Kano Disco covers Kano, Jigawa and Katsina States, with a distribution capacity of 365 megawatts and peak load demand of 596 megawatts. Port Harcourt Disco covers Cross Rivers, Akwa Ibom, Rivers and Bayelsa States, with a distribution capacity of 486 megawatts and peak load demand of 773 megawatts. Yola Disco covers Adamawa, Taraba, Borno and Yobe States, with a distribution capacity of 138 megawatts and peak load demand of 176 megawatts.

81 MJS Partners (2012).

82 Oke (2012a).

83 See Schmidt (2014).

84 (ibid). See *CSC Neckartal Dam Joint Venture v Tender Board of Namibia & Others*, Suit No. (A109/2013); [2013] NAHCMD 186 (4 July 2013), para 9.

became messy and the tender was cancelled. In early 2013, the tender was finally awarded to Salini, a company which had absorbed Impreglio. The court documents revealed inconsistencies within the evaluation report submitted to the Tender Board by the Ministry. The High Court set aside the tender award and referred the matter back to the Tender Board for review.[85] This case makes it clear that post privatisation strategies and initiatives need to be deployed to remedy logistical and operational challenges arising from the privatisation exercise, to ensure that it meets the general expectation of local and foreign investors in terms of transparency and that level playing fields have indeed been provided for bidders and other stakeholders.

5.3 Post Privatisation Initiatives

As part of post privatisation strategies, the Nigerian Electricity Regulatory Commission (NERC), in April 2014, came up with the *Interim Rules for Transitional Electricity* for the period between completion of privatisation and the start of the Transitional Electricity Market (TEM). The interim rules are meant to guide the conduct of the market in the pre-TEM phase until the declaration of TEM. The Interim Rules are intended to cover electricity procured from the transmission system by the distribution companies (Discos) with a view to taking into account any bilateral arrangements between generation companies (Gencos) and Discos.[86]

The objectives of the rules includestablishing a framework to govern trading arrangements during the interim period when power purchase agreements (PPAs) are drawn up between the Gencos and the Nigerian Bulk Electricity Trading PLC (NBET). The rules also seek to manage the probable revenue shortfall in the industry by determining the revenue allowable to market participants and service providers during the interim period.[87] The rules likewise establish the payment arrangement and flow of funds from Discos through the market operator to all beneficiaries by identifying the sources of funds required to ameliorate the probable shortfall in revenues collected by the Discos during the interim period.[88]

Namibia is also bound to be faced with transitional challenges of moving from a government-controlled electricity regime to a private-sector-led electricity industry. Taking a cue from Nigeria, a number of measures would need to be implemented to improve the financial viability of the sector. Creative measures would have to be introduced to address challenges in the power sector value chain. Such steps will include a review of the revenue requirement for the power sector, which is to be covered by the Multi-Year Tariff Order (MYTO) in order adequately to reflect any losses and enable recovery of

85 (ibid.:41–45).

86 Shonibare (2014:33–35).

87 (ibid.).

88 The interim rules became necessary owing to the postponement of TEM which was expected to commence March 2014, but had to be shifted as a result of inadequate gas supply. The EPSR Act provides for three market stages towards market competitiveness in the power sector. See Oke (2013).

shortfalls by the investors. A bond issuance might also be necessary, as is being proposed for Nigeria, through a special purpose vehicle (SPV) owned by the Discos and/or the Gencos, to be supported by credit enhancement mechanisms through the Central Bank of Nigeria (CBN).[89] The government of Nigeria has fixed the distribution of 212 billion Nigeria naira (about 1.5 billion US dollars) power intervention funds, the Nigerian Electricity Market Stabilisation Facility (NEMSF) for the first quarter of year 2015.[90]

5.4 Power Consumers Assistance Fund (PCAF)

Continued subsidy for imported electricity as well as renewable energy generated in Namibia by foreign and/or local investors in collaboration with multinational investors is – going by the experience of Nigeria under the old NEPA regime – patently unsustainable both in the short and long run. This may continue to signal a bleak energy future for the country. Increasing local capacity for power generation under a decentralised, fully liberalised private-sector-led energy sector becomes an inevitable reality amidst dwindling supplies of imported electricity to growing cities and population in Namibia. This helps to provide assurance that potential investors will recoup invested funds with profit. Many emerging economies, including Nigeria, have had sustained energy subsidy programmes for several years to make energy affordable to the poor and vulnerable sections of the population and to ensure adequate energy supply for domestic consumption. The new regime in Nigeria has outlawed direct subsidy for electricity consumption[91] and has replaced this subsidy with a structured, indirect subsidy that targets underprivileged electricity consumers in Nigeria by way of the Power Consumers Assistance Fund (PCAF).

PCAF is a fund set up to subsidise the cost of electricity usage for underprivileged consumers, as specified by the Minister.[92] The capital and assets of the Fund are derived from various sources, which include contributions from designated consumers, certain classes of consumers and eligible customers; and any subsidies received from the federal government as appropriated by the National Assembly.[93] However, in determining the contribution rate, the law requires the Commission to takes into consideration the impact of the rate on the contributors.[94] In Nigeria, one of the conditions precedent to an increase in electricity tariff is the existence Power Consumers Assistance Fund. This model may be considered and, if suitable, be adopted by Namibia, along with statutory-based protection of the electricity host communities, as discussed below.

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89 Shonibare (2014:34).

90 See Komolafe (2014).

91 See Section 76(2)(f) of the ESPR Act, supra note 2, which lists the phasing-out of subsidies as one of the aims of 'Tariff Methodology'.

92 The Fund was set up by NERC pursuant to Section 83 of the Electricity Power Sector Re- form Act, 2005 (EPSR ACT), which empowers NERC to set up and administer the PCAF as a subsidy regime for the benefit of underprivileged electricity consumers.

93 Section 83(3) of the EPSR Act, supra note 2.

94 Section 84(2).

5.5 Host Communities and Electricity Undertakings

Host community issues are a potent factor capable of undermining the activities of both local and foreign electricity companies operating in Nigeria, Namibia and elsewhere in Africa. Host community hostility is a new generation of foreign investment risk.[95]

Matters affecting the host populations rarely receive much attention.[96] Most legislative and contractual documents based on the exploitation of energy resources, including electricity generation, transmission and distribution, tend to be silent on devising institutional means to protect the host populations against the sometimes devastating environmental, health and social impacts of the activities of energy companies.[97]

The Nigerian electricity regime provides for an institutional framework to protect the host communities located around hydro-based power generation installations under the Hydro Electric Power Producing Areas Development Commission (HEPADC) Act[98] The HEPADC Act primarily aims to create a commission charged with the responsibility for managing the ecological menace of hydro-based electricity due to the operation of dams, and for related matters affecting the hydroelectric power-producing states and areas in Nigeria. The experience of Nigeria in the series of agitations by the resource-bearing communities led to the enactment of the HEPADC Act[99] which commission is charged with the responsibility for managing the environmental and ecological distortions brought about as a result of the operation of dams, and for related matters.[100]

The HEPADC Act takes a cue from similar regulatory frameworks in the area of communities' agitations ranging from the Oil Mineral Producing Areas Development Commission (OMPADEC),[101] the Niger Delta Development Commission (NDDC)[102] and the Ministry of Niger Delta, among others. The model of regulatory frameworks for placating the communities in oil-producing areas is replicated with the enactment of the HEPADC Act.[103] A major inadequacy of the HEPADC Act, which Namibia should avoid, is that it focuses on communities within hydroelectric power generation environments.

95 According to Akpan (2005:311), concerns in energy resource exploitation has traditionally concentrated on the relationship between the host state and the foreign investor.

96 (ibid.:312).

97 (ibid.). Akpan argues that inability of members of the host communities to have recourse to effective remedies in both the host and the home state and under international law against activities of players in the energy sector that have deleterious effects on them has the potential of creating a new source of risk to foreign investment in the sector.

98 See Hydro Electric Power Producing Areas Development Commission, Cap H5A, Laws of Federation of Nigeria (LFN), 2004.

99 (ibid.).

100 See the long title to the HEPADC Act (ibid.).

101 See the Oil Minerals Producing Areas Development Commission (OMPADEC) Decree No. 23 of 1992.

102 See the Niger Delta Development Commission (establishment) Act, Cap N86 Laws of the Federation of Nigeria (LFN), 2004.

103 See HEPADC Act, supra note 98.

Electricity generation through hydro is becoming outdated, as power is now generated through gas, wind, solar and other renewable sources not captured in the HEPADC Act. It is for this reason that the HEPADC Act is adjudged to be grossly inadequate to regulate host community issues in the Nigerian electricity sector.[104] Nevertheless, the imperative of a legal framework for ensuring community-friendly, and socially and environmentally sustainable generation and distribution of electricity cannot be ignored by both Namibia and Nigeria.

5.6 The Role of a Bulk Electricity Trader

The Nigerian Bulk Electricity Trading Company (NBET) is an agency of the federal government of Nigeria, whose primary duty is to bulk-trade electricity, thereby providing a kind of institutional assurance to the aspirant and existing stakeholders that their output will be purchased and paid for. Put differently, the purpose of the bulk trader, particularly during the transitional stage of the Nigerian electricity market reforms, is to buy power from independent power plants producers (IPPs) and resell to the distribution companies (Discos) and eligible customers. However, NBET is a transitional institution, and is not intended to be the sole authorised or designated buyer, as other entities, such as Discos that have attained commercial viability, may also procure power directly from generation companies (Gencos).[105]

In technical terms, NBET acts as a clearing house for power-generating and distribution companies, and guarantees all purchases in the market during the transitional phase. Therefore, NBET's role in the current reform process is to use its legal backing to drive private sector investment in the industry by executing bankable power purchase agreements with power developers and winning bidders in the privatisation programme.[106]

The establishment of NBET by the Nigerian government was patterned after the similar model in the region of Ontario, Canada.[107] Lessons from the Canadian province of Ontario in electricity restructuring suggest that NBET could play an important role in determining the eventual outcome of the power sector reforms in the country, as well as in the success of a competitive wholesale power market.[108] In the late 1990s, Ontario Hydro, the state-controlled power generation and transmission monopoly, was unbundled into several entities, and included the assignment of its liabilities to an agent, fulfilling a role similar to that to be played by the Nigerian Electricity Liability Management Company (NELMCO). In 2004, the Ontario Power Authority (OPA) was established as a special purpose and non-share capital statutory corporation, with functions similar to NBET. Both NBET and OPA share a lot in common. According to Clark and Grover the policy objective of both NBET and the OPA is the same:

104 See generally, Oke (2013).
105 See NBET (2011).
106 (ibid.). See also Bala-Gbogbo (2014).
107 Clark & Grover (2014).
108 (ibid.).

> to provide independent power producers and other sellers of power with a creditworthy counter-party to power purchase agreements, and ensure that such agreements would be financeable by third-party lenders. With Nigeria currently at an earlier stage than Ontario regarding the development of a competitive and private sector driven electricity industry, it is has the advantage of learning from solutions and mistakes from early movers such as Ontario, including understanding the role that a bulk trader or single-buyer can play in the country's restructuring.[109]

The establishment of a bulk trader is designed to, and – all things being equal – is expected to, boost the confidence levels of doubting investors. The bulk trader has proved vital in Ontario and is presently instilling high levels of confidence in investors in the Nigerian electricity sector as regards the sustainability of reforms in the country's power sector.[110] In view of the crucial role of the bulk trader, Namibia should seriously consider the establishment of a bulk electricity trader like that in the Ontario region, whose model was borrowed by and transplanted[111] to Nigeria.

5.7 Dispute Resolution Mechanisms

Effective dispute resolution mechanisms are required in Namibia for resolving sector-based disagreement in a win-win manner without impacting negatively on a socially sensitive sector like power. In Nigeria, the *Business Rules of the Nigerian Electricity Regulatory Commission*[112] contains detailed descriptions of dispute resolution mechanisms and frameworks. This makes the Commission predictable and operationally specific when dealing with dispute resolution with stakeholders like licensees, electricity customers, consumers, governments, agencies, bodies and other institutions in electricity and related matters. The detailed dispute resolution framework of the Nigerian power sector is discussed elsewhere by the writer.[113] However, for the purpose of this article the law and procedure for the resolution of electricity disputes by arbitration are discussed with a view to suggesting similar or related frameworks for Namibia.

Arbitration of electricity disputes between licensees arising from the operations of the Market Rules or Grid Code in Nigeria is provided for in Schedule I of the *Business Rules*. The rule provides that such disputes shall be referred to the Dispute Resolution Panel (DRP) established by the Commission for resolution by way of arbitration.[114] By this provision, arbitration is implied in all disputes relating to licensees in respect of the Market Rules and Grid Code, unlike the rule that parties must have envisaged and provided for arbitration in their agreement or contract.[115]

109 (ibid.).

110 See Okafor (2012).

111 On meaning and discourses of 'legal transplant' see Legrand (1997); and Watson (1978:552; 1981:1473). See also Adinkrah (1980:1); Wise (1990:1); and Miller (2003:839).

112 *Business Rules of the Nigerian Electricity Regulatory Commission*, 2006.

113 See Oke (2013).

114 See Schedule 1(1) of the NERC Business Rules, 2006.

115 Arbitration as a dispute resolution mechanism could be voluntary or mandatory. Arbitra-

Arbitration of all other disputes arising between licensees or in respect of matters arising from the provisions of the Act as it affects the licensees and consumers and third parties may also be referred to the Commission for resolution by the party or parties.[116]

Similarly, other disputes between licensees, or licensees and consumers, or third parties referred to the Commission for arbitration shall follow the procedure set out under the Schedule.[117] Any party may commence arbitration by serving a Notice of Arbitration to the Commission and the other party to the dispute, and the Commission will then issue a notice to the other parties concerned to show cause why the dispute should not be settled by arbitration. The Commission may proceed to make an order directing that the dispute be referred for settlement through arbitration by the Commission.[118]

Where a matter is referred to the Commission for arbitration, it may refer the matter to a sole arbitrator or tribunal of three arbitrators with sufficient competence in the subject. The arbitrator is to be independent of the parties and should determine the dispute in an impartial and timely manner.[119] The rules forbid the appointment or nomination by the Commission of a person as arbitrator to whom any of the licensees or other parties in the arbitration has a reasonable objection on the grounds of possible bias or a related reason.[120]

The arbitrator is at liberty to adopt such procedure as he or she may consider appropriate, with the consent of the third parties. The procedure must be consistent with natural justice to enable a fair and speedy resolution of the dispute. The arbitrator should also issue directions to the parties regarding the filing of a statement of claims, a statement of defense, counter claims and other supporting documents.[121] The arbitrator should also make a provisional award, subject to the approval of the Commission, within seven days.[122] After the hearing, the arbitrator makes a written award, stating reasons for the decision on all issues arising for determination and forwards the award to the Commission within 60 days of the commencement of the proceedings.[123] The principle of arbitration requires that parties comply with the award. *The Business Rules* provide for the enforcement of the award in respect of arbitration forming the basis of the provisions of the schedule to the rules. The Rules state: "Where a party fails to abide by an arbitration award, the successful Party to the award shall apply to the High Court for

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tion pursuant to the Business Rules is a form of mandatory arbitration. Mandatory arbitration occurs pursuant to a statute or from a contract voluntarily entered into by the parties to resolve their disputes by arbitration.

116 Schedule 1(3).
117 Schedule 1(4).
118 Schedule 2(1), (2) and (3).
119 Schedule 3(1) and (2).
120 (ibid.:Schedule 3(3)).
121 Schedule 4(1) and (2).
122 Schedule 4(5).
123 Schedule 4(6).

enforcement of the award."[124] The essence of arbitration is that the parties will comply with the award of the arbitrator.

For Namibia, resolution of electricity-related matters may be accelerated through statutory provisions for arbitration or specialised mechanisms for the resolution of disputes relating to electricity. Unlike the case of the Neckartal Dam project, bedevilled by hiccups and litigation for which no preparation was made, Namibia would do well to create avenues for the resolution of electricity-related disputes – which are inevitable – in a business like and win-win manner without undermining future business opportunities and relationships between parties to the disputes.

6 Conclusion

Given the arguments presented above, this article concludes that energy security poses a major challenge to socioeconomic development in Namibia. Therefore, there is an urgent need to devise necessary legal and institutional frameworks for dealing with energy challenges in the country. The energy market is becoming increasingly competitive across the world owing to the dynamics of globalisation. This necessarily means that Namibia might face difficulties in attracting competitive foreign (and sometimes local) investments in the power sector, unless it puts in place certain regulatory and institutional frameworks to create a level playing field for all stakeholders under a strong, efficient and effective sector regulator, similar to that of Nigeria. Sector-specific initiatives, policies and institutions, including the means for specialised resolution of electricity-related disputes, among other requirements argued above, are also indispensable to securing a better future for Namibians. This makes it appropriate to draw useful lessons from the energy sector reforms and privatisation in Nigeria to guide Namibia in dealing effectively with present and future energy challenges.

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7.
COMPARATIVE LEGAL ASPECTS OF THE POTENTIAL OF RENEWABLE ENERGIES TO PROMOTE ENERGY SECURITY, SUSTAINABLE DEVELOPMENT AND CLIMATE CHANGE MITIGATION: GERMANY, SOUTH AFRICA AND NAMIBIA

Oliver C. Ruppel & Katharina Ruppel-Schlichting

1 Introduction

Energy security is one of the most important topics of our times. Energy is an essential requirement for all fields of our daily life, for the functioning of social and political systems, businesses, and communication, and for economic growth and sustainable development, among others. Primary energy is embodied in natural resources such as crude oil, natural gas and coal, which have to undergo anthropogenic conversion in order to become usable energy. Another type of energy is renewable energy, which is

> obtained from the continuing or repetitive flows of energy occurring in the natural environment and includes low-carbon technologies such as solar energy, hydropower, wind, tide and waves and ocean thermal energy, as well as renewable fuels such as biomass.[1]

To secure an energy supply that meets the growing demand is one of the major global energy challenges. So far, no commonly accepted definition of the term 'energy security' exists. The International Energy Agency (IEA) has defined energy security as "the uninterrupted availability of energy sources at an affordable price."[2] According

1 See the definition of energy by the IPCC in its Special Report on Renewable Energy Sources and Climate Change Mitigation, IPCC (2012:Annex 1, Glossary).

2 See the International Energy Agency at http://www.iea.org/topics/energysecurity/, last accessed 7 November 2014. Of course, definitions of energy security vary and the definition proposed by the IEA is very broad and leaves questions unanswered, such as the question about what can be considered 'affordable' under the definition above.

to the IEA, energy security has a long-term component which

> mainly deals with timely investments to supply energy in line with economic developments and environmental needs. On the other hand, short-term energy security focuses on the ability of the energy system to react promptly to sudden changes in the supply-demand balance.[3]

In very general terms, energy security can be understood as robustness against disruptions of energy supply.

Energy security plays an important role at the crossroads of national security, economic security and environmental security, and is thus equally high on the agenda of national and international politicians, scientists and economists. To achieve secure, clean and efficient energy is the target of many national governments[4] and regional groups,[5] as securing energy supply is considered to be one of the means to overcome poverty and to achieve the millennium development goals (MDGs).

There is no question about the importance of energy security, in general; nor about its relevance for economic growth and development, in particular. However, in light of the fact that energy-related carbon dioxide emissions make up most global greenhouse gas (GHG) emissions, the world community is charged with the task of balancing the extension of energy supply, on one hand, and the consumption of energy, on the other, in order to reduce the extent of climate change – one of the major challenges of our time. Thus, international climate change negotiations are fundamentally about energy use and the linkages between energy and economic development.

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3 International Energy Agency at http://www.iea.org/topics/energysecurity/, last accessed 7 November 2014.

4 Namibia's Vision 2030, for example, sets out the objectives to achieve high value-added products and services; to provide security of energy supply through an appropriate diversity of economically competitive and reliable sources; to ensure that households and communities have access to affordable and appropriate energy supplies; and to establish an energy sector that is efficient and that makes contributions to Namibia's economic competitiveness. Vision 2030 defines, as one of its strategies, the promotion of renewable energy sources and the implementation of projects for production from these sources to meet industry demand. See GRN (2004:87).

5 The European Union (EU) for example "has agreed on ambitious Energy and Climate targets for 2020 and beyond to reduce greenhouse gas emissions, increase the share of renewable energies and improve energy efficiency. Achieving these objectives advances Europe along the path to an energy system that will deliver a competitive and secure energy supply which is sustainable." See EC (2014a). At a recent meeting of the European Council at the EU Summit in Brussels on 23 and 24 October 2014, EU leaders agreed to reduce greenhouse gas emissions by at least 40% compared to the 1990 level, and to increase energy efficiency and renewables by at least 27%.

2 Energy Security and Climate Change – Findings from the IPCC

The Intergovernmental Panel on Climate Change (IPCC) was established by the United Nations Environment Programme (UNEP) and the World Meteorological Organisation (WMO) in 1988. It is the ultimate role of the IPCC to assess – on a comprehensive, objective, open and transparent basis – the scientific, technical and socioeconomic information relevant to understanding the scientific basis of risk of human-induced climate change, its potential impacts and options for adaptation and mitigation.

The IPCC has launched its *5th Assessment Report (AR5) on Climate Change,*[6] with the contribution by Working Group I on *The Physical Science Base* in 2013, the contribution by Working Group II on *Impacts, Adaptation and Vulnerability* in 2014, and the contribution by Working Group III on *Mitigation of Climate Change*. In its report, the IPCC has again most rigorously reviewed and assessed the most recent scientific, technical and socioeconomic information produced worldwide relevant to the understanding of climate change. The fact that energy and particularly renewable energies are closely linked to climate change is reflected not only in *AR5*, but also in a *Special Report on Renewable Energy Sources and Climate Change Mitigation* (SRREN), which had already been published by the IPCC in 2012. The SRREN has impartially assessed the scientific literature on the potential role of renewable energy in the mitigation of climate change for policy makers, the private sector, academic researchers and civil society. Six renewable energy sources are covered by the report, namely bioenergy, direct solar energy, geothermal energy, hydropower, ocean energy, and wind energy; and an assessment has also been made on how these renewable energy resources are integrated into present and future energy systems. The report furthermore considers the social and environmental consequences associated with the deployment of renewable energy technologies. Strategies to overcome technical as well as non-technical obstacles to their application and diffusion are presented, and costs of energy from renewable energy sources are compared to recent non-renewable energy costs.

The aforementioned reports are of great relevance with regard to many aspects of energy security and contain a solid base for further debate on this important topic. A general message from the reports can be summarised as follows: there is no doubt that we live in a world which is altered by climate change, one of the greatest challenges of the 21st century. Climate change poses risks to human and natural systems and has the potential to impose additional pressures on the various aspects of human security.[7] The risks and impacts related to climate change can be reduced by improving society to decrease vulnerability and hand down the overall risk level (adaptation) and by reducing the amount of climate change that occurs. Thus, energy technologies play an important role in the field of climate change mitigation. Greenhouse gas (GHG) emissions resulting from the provision of energy services have contributed significantly to the increase in

6 Report available from http://www.ipcc.ch/report/ar5/, last accessed 28 May 2014.

7 Adger & Pulhin (2014:760).

atmospheric GHG concentrations and most – about 60% in 2010[8] – global anthropogenic GHG is attributed to the consumption of fossil fuels. Options for lowering GHG emissions from the energy system while still satisfying the global demand for energy services include energy conservation and efficiency, fossil fuel switching, nuclear and carbon capture and storage (CCS) and low-GHG energy supply technologies such as renewable energy.

Energy security and climate change share the need for innovation and technology, smart policy making, high levels of government attention, effective diplomacy, and international cooperation. Synergy effects will occur from innovative actions that make for a more secure energy system, as these may also result in reducing the warming emissions that come from energy supplies.[9]

The nexus between climate change and energy security has been focused upon in the IPCC's assessment and it has been found that

> most climate policies intersect with other societal goals, either positively or negatively, creating the possibility of 'co-benefits' or 'adverse side-effects'. Since the publication of AR4 a substantial literature has emerged looking at how countries that engage in mitigation also address other goals, such as local environmental protection or energy security, as a 'co-benefit' and conversely. This multi-objective perspective is important because it helps to identify areas where political, administrative, stakeholder, and other support for policies that advance multiple goals will be robust. Moreover, in many societies the presence of multiple objectives may make it easier for governments to sustain the political support needed for mitigation. Measuring the net effect on social welfare requires examining the interaction between climate policies and pre-existing other policies.[10]

It has been observed that the driving forces for climate policy are not solely the concern about climate change. This can be seen from the various efforts of national governments in which the issue of climate change is addressed in the context of other national objectives such as the alleviation of poverty and the achievement of energy security. "For countries that want to reduce their dependence on imported fossil fuels, climate policy can bolster energy efficiency and the domestic renewable energy supply, while cutting GHG emissions."[11]

3 The Role of Renewable Energies for Sustainable Development and in the Fight Against Climate Change

It is widely recognised within the international community that the deployment of renewable energies is an important means for mitigating climate change.[12] Equally well

8 Victor et al. (2014:122).

9 See also World Economic Forum (2012).

10 Edenhofer et al. (2014:40).

11 Kolstad & Urama (2014:237).

12 See, for example, the speech of the executive secretary of the United Nations Framework Convention on Climate Change, Christiana Figueres on the occasion of the Investor

acknowledged is the necessity of promoting renewable energies to foster technological and competitive performance. Correspondingly, support mechanisms have been introduced in many countries worldwide.

> The relative importance of the drivers for RE differ from country to country, and may vary over time. Energy access has been described as the primary driver in developing countries whereas energy security and environmental concerns have been most important in developed countries.[13]

The current over-reliance on finite traditional sources of energy, which are patchily distributed across the world's regions, has resulted in an intense competition over these resources. However, when looking at the ratio of proved reserves to current production, it is estimated that, globally, oil and natural gas will be exhausted in about four and six decades, respectively.[14] Assessing the theoretical potential of renewable energy, the IPCC in its SRREN concludes that "the theoretical potential is much greater than all of the energy that is used by all the economies on Earth."[15] If supported by the right enabling public policies, close to 80% of the world's energy supply could be met by renewables by mid-century.[16] While fossil energies are the engine of today's global economy,[17] renewable energies are one of the guarantors of a future-proof energy supply and they do play an important role in the fight against climate change. Wind power, solar energy, hydropower plants, geothermal energy, and energy from biomass are becoming important economic trends and key mechanisms to mitigate climate change. Technologies which supply energy with a limited production of greenhouse gases contribute to reducing the dependency on fossil fuels such as coal, oil and gas and are constantly being developed further with a view to achieving a globally sustainable energy supply.

Efforts to strengthen the renewable energy sector in general and to develop relevant technologies to this end have increasingly been subject to various international climate-related negotiations, particularly to the discussions and decisions of the Conference of the Parties (COP) of the United Nations Convention on Climate Change. In one of its latest decisions, the COP at its 20th session in Lima, Peru, in December 2014 has agreed on the *Lima Call for Climate Action*,[18] in which the Parties reaffirmed that

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Summit on Climate Risk in January 2014, in which she urged investors to move into green investments, UNFCCC (2014).

13 See IPCC (2012:148).

14 (ibid.:122).

15 (ibid.:181).

16 IPCC (2011).

17 Within the 2012 estimates on energy share of global final energy consumption, fossil fuels amounted to 78,4%, nuclear energies 2,6% and renewables to 19% of the global share, REN21 (2014:21).

18 Advance unedited version available at http://unfccc.int/files/meetings/lima_dec_2014/application/pdf/auv_cop20_lima_call_for_climate_action.pdf, last accessed 15 December 2014.

> all developing countries need access to the resources required to achieve sustainable social and economic development and that, in order for developing countries to progress towards that goal, their energy consumption will need to grow, taking into account the opportunities for achieving greater energy efficiency and for reducing greenhouse gas emissions, including through the application of new technologies on terms which make such an application economically and socially beneficial.

With regard to financing, it has been laid down as a guiding principle that the mobilisation and provision of finance will, among others, support the integration of climate objectives into other policy-relevant areas and activities, such as energy and development policy and plans in line with country circumstances and according to countries' priorities. The establishment of an international renewable energy and energy efficiency bond facility has been envisaged.

Although the deployment of renewable energy technologies does face market challenges primarily owing to the maturity of the conventional energy markets and technical and financial restraints in the development of RE technology, the need for promotion of renewable energies is becoming more evident than ever before. It is for good reason that the mitigation of dangerous anthropogenic climate change is seen as one strong driving force behind the increased use of RE worldwide. In addition to this, there are a number of interactions between RE and sustainable development which speak in favour of an increased use of RE: RE technologies are essential to address energy supply concerns and offer the opportunity to contribute to social and economic development, employment creation and the reduction of environmental and health impacts. Moreover, these technologies do also play an important role in terms of climate change adaptation.[19] Not only can RE technologies contribute towards less negative effects on our climate by way of emission reduction, such technologies can also contribute towards more reliable energy access, which particularly applies to oil-importing developing countries. For these, an increased uptake of RE technologies could be an avenue to "redirect foreign exchange flows away from energy imports towards imports of goods that cannot be produced locally, such as high-tech capital goods".[20]

The understanding of the necessity to promote the deployment of renewable energy technologies is reflected in some figures on growth in the renewable energies sector, as provided by the IPCC:

> On a global basis, it is estimated that RE accounted for 12.9% of the total 492 EJ of primary energy supply in 2008. The largest RE contributor was biomass (10.2%), with the majority (roughly 60%) of the biomass fuel used in traditional cooking and heating applications in developing countries but with rapidly increasing use of modern biomass as well. Hydropower represented 2.3%, whereas other RE sources accounted for 0.4%. In 2008, RE contributed approximately 19% of global electricity supply (16% hydropower, 3% other RE), biofuels contributed 2% of global road transport fuel supply, and traditional biomass (17%), modern biomass (8%), solar thermal and geothermal energy (2%) together

19 See IPCC (2012:40).

20 (ibid.:122).

> fuelled 27% of the total global demand for heat. The contribution of RE to primary energy supply varies substantially by country and region. Scenarios of future low greenhouse gas futures consider RE and RE in combination with nuclear, and coal and natural gas with carbon capture and storage.
>
> While the RE share of global energy consumption is still relatively small, deployment of RE has been increasing rapidly in recent years. Of the approximately 300 GW of new electricity generating capacity added globally over the two-year period from 2008 to 2009, 140 GW came from RE additions. Collectively, developing countries hosted 53% of global RE power generation capacity in 2009. Under most conditions, increasing the share of RE in the energy mix will require policies to stimulate changes in the energy system. Government policy, the declining cost of many RE technologies, changes in the prices of fossil fuels and other factors have supported the continuing increase in the use of RE. These developments suggest the possibility that RE could play a much more prominent role in both developed and developing countries over the coming decades. [21]

The important role of renewable energies for sustainable development has also been underlined in recent United States' Legislation. On 8 February 2016, the US Government passed into law a long-term commitment to actively contribute to the transformation of the electricity market in sub-Sahara Africa, namely the Electrify Africa Act of 2015[22], which had been passed by the House of Representatives and Senate of the United States (US). The new Act is an important legislative tool with the primary focus being the improvement of access to affordable and reliable electricity in sub-Saharan Africa. It has been stipulated as the Act's purpose to

encourage the efforts of countries in sub-Saharan Africa to improve access to affordable and reliable electricity in Africa in order to unlock the potential for inclusive economic growth, job creation, food security, improved health, education, and environmental outcomes, and poverty reduction.

As statement of policy, the Electrify Africa Act of 2015 identifies among other things, to promote first time access to electricity and power services for at least 50 million people in sub-Saharan Africa by 2020, encourage installation of at least 20,000 additional megawatts, encourage necessary in-country reforms, and promote an all-of the above energy development strategy for sub-Saharan African that includes the use of oil, natural gas, coal, hydroelectric, wind, solar, and geothermal power, and other sources of energy, as appropriate.

In partnership with sub-Saharan countries, it is envisaged to develop an implementation strategy with clear policy goals and respective coordination, monitoring and evaluation mechanisms. Further objectives laid down in the Act include to promote

- non-discriminatory, reliable, affordable and sustainable electricity in urban areas; policies to facilitate public-private partnerships;

21 IPCC (2012:165).

22 Available at https://www.congress.gov/bill/114th-congress/senate-bill/2152/text, last accessed 17 February 2015.

- the displacement of kerosene lighting with other technologies;
- an energy development strategy for sub-Saharan Africa that includes the use of oil, natural gas, coal, hydroelectric, wind, solar, geothermal power and other sources of energy; and
- to encourage electricity generation, distribution, pricing and regulatory reforms and an increase in private financing.

To this end, close collaboration with sub-Saharan African countries, international financial institutions, African regional economic communities, cooperatives and the private sector are envisaged. The US President is furthermore directed, to establish a multiyear strategy to assist countries in sub-Saharan Africa implement national power strategies and to ensure that the strategy remains responsive to local community concerns and technological innovation. With regard to investment, the Act provides that the US President should use US influence at international bodies to advocate for increasing investment in power sector and electrification projects in sub-Saharan Africa; addressing energy needs of individuals and communities where electricity grid access is impractical or cost-prohibitive, enhancing private sector coordination; and assisting sub-Saharan African governments to remove unnecessary regulatory barriers to investment.

4 Climate Change and Renewable Energies: The Regulatory Framework at International Level

Energy security is crucial for keeping economies competitive, for enhancing sustainable development, and for reducing poverty. It is thus on the one hand surprising that no global energy security system exists. On the other hand, it has to be taken into consideration that global energy governance must take into account a variety of topics, including climate change, development, environmental protection, trade, investment, and human security, which explains the fact that the global energy governance regime is fragmented with its many components being managed in a disjointed manner, bringing about overlaps as well as normative gaps. Numerous instances of inter-state cooperation interrelate and create a normative patchwork with implications for the global energy economy and security. This can be attributed to the pursuit of national interests, the diversity of energy sources, and the plurality of relevant institutions and agreements.[23]

Many international organisations are operating in the field of energy matters and include, among many others, the International Energy Agency (IEA); the Organization of the Petroleum Exporting Countries (OPEC), the Gas Exporting Countries Forum (GECF); the International Energy Forum (IEF); the World Trade Organization (WTO); and the International Renewable Energy Agency (IRENA).

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23 For these and further aspects on the fragmentation of the global energy economy, see Leal-Arcas & Filis (2013).

A large number of international processes promote the acceleration of the deployment of renewable energies as an important part of designing a sustainable energy framework for the future. Among them are the millennium development goals and the United Nations secretary general's Sustainable Energy for All Initiative, which is focused on three objectives, namely to ensure universal access to modern energy services (over one billion people worldwide lack access to electricity), to double energy efficiency (global energy-related carbon dioxide emissions could rise 20% by 2035; equipment maintenance, thermostat settings, and upgrades can reduce emissions by up to 50%), and to double the renewable energy share in the overall global energy mix by 2030 (global energy demand will grow up to 33% from 2010 to 2035).[24]

Relevant instruments of a more legal nature include the UN Charter,[25] which sets out some foundation for international agreements relevant to energy-related issues by providing, for example, for the preservation of sovereignty over domestic matters, including the management of natural resources and especially of energy-related resources. Besides this, there are many other relevant international agreements, such as the Energy Charter Treaty and the legal regime of the WTO.[26]

Interrelating issues between climate change and energy security are most pertinently addressed within the regimes under the United Nations Convention on Climate Change (UNFCCC) and its Kyoto Protocol, which also address the environmental impacts of energy. Commitments to reduce GHG emissions are subject to the ongoing international climate change negotiations and international agreements, and an increased use of RE is a key element in subsequent implementation on the national level.

The UNFCCC, as adopted in 1992, was designed to protect the climate system for present and future generations. It recognises that in order for developing countries to progress towards sustainable social and economic development,

> their energy consumption will need to grow taking into account the possibilities for achieving greater energy efficiency and for controlling greenhouse gas emissions in general, including through the application of new technologies on terms which make such an application economically and socially beneficial.[27]

Within the framework of the Kyoto Protocol, the enhancement of energy efficiency has been stipulated as a means for countries to achieve the quantified emission limitation and reduction commitments. This highlights the need for research, promotion, development, and increased use of new and renewable forms of energy.[28] Thus, for many countries the need for promotion of renewable energies results from their obligations under the legal regime of the UNFCCC/Kyoto Protocol. Consequently, there are various activities

24 For more details on this initiative, see http://www.se4all.org, last accessed 11 February 2015.

25 Available at http://www.encharter.org/fileadmin/user_upload/document/IEC/IEC_text_brochure_ENG.pdf, last accessed 30 January 2015.

26 On renewable energies, subsidies and the WTO, see Bougette & Charlier (2014).

27 See Preamble of the UNFCCC.

28 Article 2 of the Kyoto Protocol.

on the UNFCCC level related to renewable energies, such as discussions on how the deployment of renewable energies and energy efficiency improvements can unlock climate change mitigation opportunities.[29]

Global energy transition will continue to be high on the international stage in future, not only in terms of a new UN climate agreement, but also regarding a post-2015 agenda with universally applicable (applicable to all countries, not just developing nations and emerging economies), sustainable development goals (SDGs), which have been developed by the UN Open Working Group and adopted in 2015.[30] The goal pertinent to energy has been defined as follows:

> Goal 7. Ensure access to affordable, reliable, sustainable, and modern energy for all
>
> 7.1 by 2030 ensure universal access to affordable, reliable, and modern energy services
>
> 7.2 increase substantially the share of renewable energy in the global energy mix by 2030
>
> 7.3 double the global rate of improvement in energy efficiency by 2030
>
> 7.a by 2030 enhance international cooperation to facilitate access to clean energy research and technologies, including renewable energy, energy efficiency, and advanced and cleaner fossil fuel technologies, and promote investment in energy infrastructure and clean energy technologies
>
> 7.b by 2030 expand infrastructure and upgrade technology for supplying modern and sustainable energy services for all in developing countries, particularly LDCs and SIDS.[31]

5 Regulatory Framework on Energy in the Southern African Development Community (SADC)

Challenges related to energy are increasingly being addressed on the sub-regional level with regional integration as a motor for the creation of new opportunities for renewable energies and energy efficiency technologies. Major pressing energy challenges include the limited access to energy and energy security, but also household air pollution as a result of cooking and heating with solid fuels and adverse impacts on overall environmental quality resulting from the extensive use of coal. Currently, the Southern African Development Community (SADC) generates about 74% of its electricity from coal thermal stations. Renewable energy sources, which are in abundance across the region, are not yet considered as major contributors to the region's electricity needs, save for hydropower that accounts for about 20% of the SADC's total energy generation.[32] According to the African Development Bank, the SADC region has the potential to

29 For example technical expert meetings and related follow-ups on energy efficiency or renewable energy in the pre-2020 period. See http://unfccc.int/bodies/awg/items/8112.php, last accessed 30 January 2015.

30 Ruchser (2015).

31 Available at https://sustainabledevelopment.un.org/focussdgs.html, last accessed 30 January 2015.

32 *The Villager* (2015).

become a "gold mine" for renewable energy owing to the abundant solar and wind resources that are now hugely sought after by international investors in their quest for clean energy.[33]

For the time being, however, wide disparities exist in terms of access to electricity between SADC countries and between urban and rural areas, as shown in Table 1 below.

Table 1: *Electricty access in SADC states*

Country	Share (%) of population with electricity access (2012)	Share (%) of population with electricity access in urban areas (2012)	Share (%) of population with electricity access in rural areas (2012)	Share (%) of renewable energy in total final energy consumption (2012)
Angola	30	46	6	57,2
Botswana	66	75	51	23,9
DRC	9	24	1	96,0
Lesotho	28	55	17	40,5
Madagascar	15	37	4	78,4
Malawi	9	33	5	78,7
Mauritius	100	100	100	34,0
Mozambique	39	66	27	88,4
Namibia	30	50	17	32,9
Seychelles	97	97	97	0,5
South Africa	85	88	82	16,9
Swaziland	27	40	24	39,9
Tanzania	24	71	7	88,2
Zambia	26	45	14	88,2
Zimbabwe	40	80	14	75,6

Source: Table compiled by author with figures based on figures from REN21 (2015:19f.).

Although the SADC is committed to renewable energy, a number of challenges remain:

- renewable energy entails high upfront costs, especially for technology;
- most renewable energy equipment is imported, with no local options for manufacturing;

33 See Ngwawi (2015).

- there may not be capacity to connect large-scale energy projects to the grid;
- much renewable energy equipment is of poor quality and the region lacks appropriate testing facilities to ensure effectiveness;
- research, development, and production of renewable energy infrastructure occur outside the region and there are no localisation strategies in place;
- renewable energy depends heavily on donor subsidies at present;
- there are no guidelines for assessing the impacts and benefits of renewable energy incentives, such as feed-in tariffs; and
- data on possible deforestation caused by biomass development is lacking, inhibiting progress on regulation and decision-making.[34]

Against the backdrop that large areas of Africa remain without access to modern energy, the SADC has emphasised the need to increase energy security throughout the history of renewable energy policy in the region, which is captured in the SADC's legal and institutional frameworks. Although implementation of energy-related policy has been slow, the region has made some strides, particularly in electricity. At present, nine member states of the SADC have merged their electricity grids into the Southern African Power Pool[35], reducing costs and creating a competitive common market for electricity in the region. Similarly, the SADC has established the Regional Electricity Regulatory Association, which has helped in harmonising the region's regulatory policies on energy and its subsectors.

5.1 The SADC Protocol on Energy

The SADC Protocol on Energy came into force in April 1996 to develop a coordinated approach towards the development of energy and energy pooling to ensure security and reliability of energy supply and the minimisation of costs. According to the general principles contained in Article 2, SADC member states are urged to:

1. Use energy to support economic growth and development, alleviation of poverty and the improvement of the standard and quality of life throughout the Region.
2. Use energy to promote collective self-reliance among Member States.
3. Ensure that the development and use of energy takes cognisance of the gender realities of the Region.
4. Encourage the development and transfer of science and technology related to energy through the promotion of research and development and the evolution and use of comparable methods and standards.
5. Fully accept the responsibility to share the costs associated with institutional mechanisms created for the effective implementation of this Protocol.

34 See http://www.sadc.int/themes/infrastructure/en/hydropower/, last accessed 3 November 2015.

35 For more details see http://www.sapp.co.zw, last accessed 2 November 2015.

6. Settle all disputes peacefully, amicably and in accordance with procedures ….
7. Promote and encourage the direct participation of citizens and communities in the development and use of energy.
8. Ensure that the development and use of energy is environmentally sound.
9. Create a conducive environment for the private sector to participate fully in energy development in the Region.
10. Ensure that sectoral and sub-sectoral regional energy policies and programmes shall be in harmony with the overall policies and programmes of SADC and with the strategies and programmes of other SADC sectors.

The objectives of energy cooperation within SADC have been captured in Article 3 of the Protocol. The aim is to:

1. Strive to harmonise national and regional energy policies, strategies and programmes on matters of common interest based on equity, balance and mutual benefit.
2. Co-operate in the development of energy and energy pooling to ensure security and reliability of energy supply and the minimisation of costs.
3. Co-operate in the development and utilisation of energy in the Region in the following sub-sectors: woodfuel, petroleum and natural gas, electricity, coal, new and renewable energy sources, energy efficiency and conservation, and other cross-cutting themes of interest to Member States.
4. Strive to ensure the provision of reliable, continued and sustainable energy services in the most efficient and cost-effective manner.
5. Promote joint development of human resources and organisational capacity building in the energy sector.
6. Co-operate in the research, development, adaptation, dissemination and transfer of low-cost energy technologies.
7. Strive to achieve standardisation in appropriate energy development and application including the use of common methods and other techniques.

Pursuant to Articles 3 and 10 of the Protocol, Annex 1 of the Protocol on Energy sets forth guidelines for cooperation for promoting renewable energy production and usage. Substantive provisions are made in the Annex with regard to specific sub-sectors, namely electricity; petroleum and natural gas; coal; woodfuel; new and renewable sources of energy; and energy efficiency and conservation. For each of the sub-sectors, a set of target activities is established in Annex 1 to the Protocol and include, among others, the following: developing appropriate financing mechanisms and introducing favourable tax regimes for both renewable energy and energy efficiency, targeting reductions in commercial energy intensity, and involving utilities in energy efficiency schemes.

The institutional mechanism for the implementation of the Protocol is a Commission established by Article 4 of the Protocol.

Although the Protocol and its Annex provide an initial guideline for programming, they do not suggest specific mechanisms for implementation, nor do they set quantitative targets or establish any formal monitoring of target achievement.[36]

5.2 The Regional Indicative Strategic Development Plan

The SADC Regional Indicative Strategic Development Plan (RISDP) was originally adopted in 2003 and contained specific quantitative targets for infrastructure development (including energy) for the period 2004–2018. RISDP envisaged six energy-related targets, including that 70% of rural communities within southern Africa should have access to modern forms of energy supplies by 2018.[37]

In 2014 and 2015, a task force comprising the SADC Secretariat, all member states and key stakeholders developed and finalised the Draft Revised RISDP 2015–2020 as well as its Implementation Framework and Indicative Costs. In 2015, the SADC Summit approved the Revised Regional Indicative Strategy of Development Plan (RISDP) and Implementation Framework of 2015–2020.[38]

5.3 The Regional Energy Access Strategy and Action Plan

The Regional Energy Access Strategy and Action Plan (REASAP)[39] was approved in 2010. It sets goals for improving access to modern forms of energy. The REASAP envisages a Renewable Energy and Action Plan (RESAP) to be developed.

> The initial consultant report on RESAP suggested a number of targets for renewable energy for the period 2020-2030, including targets for 175 MW of biomass power and 500 MW of solar power by 2020. Significantly, both of these targets fall well short of targets for those SADC countries that are implementing large-scale power generation from renewable sources. Final approval of RESAP is expected in late 2016.[40]

The envisaged SADC Renewable Energy Strategy and Action Plan 2015 to 2020 (RESAP I) aims to encourage the region to achieve a renewable energy mix of at least 32% by 2020, which should rise to 35% by 2030.[41]

The establishment of the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE) has been approved by the SADC energy ministers in 2015 and Namibia has been selected as the host country of SACREEE.

36 See REN21 (2015:61).

37 SADC (2003:68).

38 GRN South Africa (2015).

39 Available at http://www.sadc.int/files/5713/5791/7436/EUEI_PDF_SADC_Regional_Energy_Access_Strategy_Mar_2010_EN.pdf; accessed 2 November 2015.

40 REN21 (2015:62).

41 *The Villager* (2015).

5.4 The Energy Sector Plan of the SADC Regional Infrastructure Development Master Plan

The Energy Sector Plan[42] was developed in 2012 as part of the SADC Regional Infrastructure Development Master Plan (RIDMP) with the aim of defining regional infrastructure requirements and conditions to facilitate the realisation of key infrastructure in the energy, water, transport, tourism, meteorology, and telecommunications sectors by 2027. It proposes that "additional capacity beyond 2027 should be based on a combination of hydro, wind and solar energy. Apart from hydropower, SADC estimates that the major renewable energy capacity addition will be from wind energy, followed by solar PV, CSP and biomass."[43]

6 General Legal Options to Support Renewable Energies at National Level

Support mechanisms for renewable energies have been introduced in many countries worldwide, with different types of promotion models. The success of these models varies and is crucially determined by the specific political commitment.[44] In order to strengthen renewable energies, national legislation can provide for specified tariffs for renewable energy production. In very simplified terms, producers of renewable energy earn a certain income for every kilowatt hour they generate (for example by installing solar systems) and can either use the produced energy or export it to the national grid and receive an export tariff.

On the national level, two main support models for renewable energies have emerged, namely feed-in tariff schemes and capacity-driven models.[45] While in feed-in tariff schemes utilities are obliged to buy energy at fixed purchase prices for a fixed term, capacity-driven models are characterised by a price which is to be decided by the market. Capacity-driven models include bidding processes and tradable quotas.[46] Both these models are given effect by way of policy targets for renewable energies and respective regulation or legislation, with the latter providing a greater level of certainty for investors.[47] Governments have been innovative when drafting support models for renewable energies, combining distinct policies in new and innovative ways in order to promote renewable energies.[48]

42 Available at http://www.sadc.int/files/5413/5293/3528/Regional_Infrastructure_Development_Master_Plan_Energy_Sector_Plan, last accessed 2 November 2015.
43 REN21 (2015:24).
44 See Lüdemann (2012:315).
45 For a more detailed discussion of these models and their peculiarities, see for example UNEP (2012:10ff.); REN21 (2014:76ff.); Lüdemann (2011:9ff.).
46 For further references and details, see Lüdemann (2011); Haas et al. (2004); Ringel (2006).
47 UNEP (2012:viii).
48 (ibid.:10).

Aside from tax exemptions,[49] feed-in tariffs are currently the most common renewable energy policy type in developing countries.[50] One main criticism of feed-in systems is the fixed price level which is not set by market rules but guaranteed by law, which constitutes a substantial market interference. Tariffs must thus be subject to (time and cost-intensive) continuous reviews and adjustments at short intervals in order adequately to reflect market changes and cost trends, considering the latest market developments and the technological state of the art.[51] However, properly set feed-in tariffs are considered to be the most efficient and effective support mechanism for the promotion of renewable energies,[52] as feed-in tariffs with a reliable legal framework grant investment security for a specific period of time and are beneficial for green economic development and job creation,[53] ultimately resulting in more access to energy, more stable electricity prices and a higher diversity in the electricity portfolio. While the integration of renewable energy technologies into the grid may indeed pose technical, financial, and administrative challenges, grid stability can be ensured by way of a strategic approach to renewable energy growth with a focus on the necessary infrastructure and required technical expertise.[54]

Capacity-driven models, particularly competitive tender systems and tradable quota models primarily aim to ensure that a fixed amount of renewable energy is generated. In capacity-driven models, electricity suppliers, electricity consumers or electricity generators are obliged to cover with renewable energies a certain share of their electricity supply, their electricity demand and their electricity generation, respectively.[55]

> In competitive bidding procedures, an auction among producers of renewable energy is organised in which tenders are given in respect of a certain quota of each renewable technology. The provider of the lowest asking price is given the contract. The European Commission for example has presented auctioning as standard procedure for allocating support for renewable energy in its Guidelines on State aid for environmental protection and energy 2014–2020.[56]

Competitive bidding systems have a high record in terms of bringing renewable energies to the grid and furthermore have the advantage of an intense price competition. Challenges related to this model include the following:

> Not all projects that are selected will actually be carried out: the rate of implementation almost always falls short of 100%. The risks for applicants are higher than in open feed-in schemes, because a proposed project may not be selected and bidders may incur costs

49 Or tax credits reducing tax liability. These are typically calculated on the basis of percentage of project cost or on project output, UNEP (2012:11).

50 UNEP (2012:14).

51 Lyster & Bradbrook (2006:198).

52 See for example Eurosolar (2006).

53 See REN21 (2014:63).

54 UNEP (2012:7).

55 (ibid.:12).

56 EC (2014b).

> or face penalties when they are unable to implement a project that has been selected. A sufficient number of bidders are required to participate, otherwise the auction will not produce a competitive result. Auctions may invoke strategic behaviour of market players which can drive up costs. Market players will also try to exercise market power. Large market actors may have a favoured position over their smaller competitors.[57]

In tradable quota models, usually a percentage or amount of energy to be generated from renewable resources is determined by government and allotted to certain operators who are free to decide whether they will fulfil the quota themselves or whether they will trade their quotas by paying another entity for covering their allocated amount.[58] The rationale of this model is that by way of competition, the costs of supplying renewable energy are kept low, in turn minimising the costs to the consumer. Despite being considered efficient in terms of energy security, tradable quota systems are criticised for not creating an economically feasible environment and for not supporting a wide range of renewable energy resources, but rather only the development of least expensive renewable energies, as the demand for these is usually the highest owing to the low prices involved.

> Capacity-driven models thus always have to balance between their gains in efficiency on the one hand and possible lack of investor security as well as ecological set backs on the other hand.[59]

The promotion of renewable energies, of course, has financial implications, and cost recovery remains a critical issue, especially for developing countries. Even if renewable energies might be less costly in the long run, the generation costs need to be lowered as much as possible in order to keep renewable energies competitive. This problem can, for example, be addressed by redirecting fossil fuel subsidies. International funding is in some cases obtained from various financing streams which provide support for renewable energy projects, such as the Global Environment Facility (GEF),[60] the Africa Renewable Energy Fund, and Nationally Appropriate Mitigation Actions (NAMAs).

Worldwide, energy investments are rising. Renewable energy investment has been rising rapidly around the world to US$260 billion last year and created 2,3 million jobs.[61] Worldwide, climate change mitigation activities attracted US$350 billion in 2011, mostly related to renewable energy and energy efficiency and approximately 30% of the global distributed adaptation finance went to Africa.[62] The key to tapping financial resources for more green economic development is to attract local as well as foreign capital. There is thus a critical need, particularly for developing countries, to encourage private sector involvement by creating investment security.

57 See De Vos & Klessman (2014).
58 Ringel (2006:8).
59 Lüdemann (2011:14).
60 GEF (2009).
61 See http://www.se4all.org/our-vision/our-objectives/renewable-energy/, last accessed 11 February 2015.
62 Niang & Ruppel (2014:1241).

7 Legal Transfer – An Option for a More Sustainable Energy Future?

The concept of legal transfer (or legal transplants,[63] reception of law, legal import or export) has a long history and is gaining importance in recent decades.[64] Legal transfer can occur with regard to statutes, regulations or other provisions, legal theories, ideas or practices, and does play a role in many fields of the law, including constitutional, commercial, comparative and environmental law. Legal transfer refers to processes through which national legal systems adapt legal ideas, provisions or practices from foreign judicial systems and transfer these into national contexts. By way of orientation towards components of a foreign legal system, a country's own legal system can be developed further, provisions of one legal system can be transferred from one country to another or from one people to another.

The concept of legal transfer is contested to some extent.[65] Critics argue that in order to be feasible, the law should develop from within local or regional structures instead of being transferred like a good from one legal system into another, which might even take the form of colonisation by exporting legal concepts from (developed) countries to other (developing) countries, without adequately taking into account the particularities of the 'importing' country.

Taking an intermediary approach, one can say – provided that comparable preconditions prevail – that it seems reasonable to contemplate the experiences of other legal systems and to benefit from certain experiences that have proved themselves in practice. Examples[66] for legal transfer include, among many others, the German Civil Code (*Bürgerliches Gesetzbuch*) which acted as a model for certain provisions of other civil law jurisdictions, e.g. those of the People's Republic of China, Brazil and Portugal. German administrative law has served to some extent as a template in the context of administrative law reform in Georgia, which, however, expanded its administrative law by adapting further elements from US American and Dutch law.[67] The 1920 Constitution of Czechoslovakia was inspired by the Austrian Constitution of 1867 and the French Constitution.[68] In the current process of administrative law reform in Namibia, foreign legal systems that are being considered for the provision of guidance are those of South Africa and Australia.[69]

Legal transfer is applied in many cases of legal drafting in the field of environmental law, in general. In the context of energy security, the transfer of technology and know-

63 This term has been coined by Watson (1974).

64 For more details on this concept see, among others, Glinz (2013:115ff.); Rehm (2008); and Seckelmann (2012).

65 For further details, see Rehm (2008:1ff.).

66 For further interesting examples of legal transfer from one country to another, see Spamann (2009).

67 Winter (2010).

68 Lachmund (2006).

69 Glinz (2013:393ff.).

how from one country to another is a current method and plays an important role in development cooperation.

Energy legislation in Germany has been an example for lawmakers in many countries and it has been suggested that perhaps no other legislation has been copied worldwide as much as Germany's Renewable Energy Act (*EEG*), for good reason:[70]

> The experience of countries with a longer tradition of using renewable energy can be tapped as regards the appropriate design and operation of frameworks suited to Namibia. Germany is a helpful example in this respect because of its world-renowned development of technologies for using renewable resources in energy production, and the policies that accompany its production of renewable energy.[71]

It is beyond any doubt that different policies and laws may be appropriate in different countries, depending on factors such as a "country's legal tradition and policy history or the maturity of the technologies being targeted".[72] Likewise, it is also very clear that countries which are still in the process of developing energy-related legislation can and should be inspired by lessons learnt from more developed countries which started much earlier with the drafting of law and policy frameworks for energy security and renewable energies.

8 Energy Transition in Germany

8.1 Background

The German *Energiewende,* which can be translated as energy transition, traces back to the anti-nuclear movement of the 1970s. The shock of the oil crisis and the meltdown in Chernobyl led to the search for an alternative energy supply. The term *Energiewende* was coined in a 1980 study by Germany's Institute for Applied Ecology, which argued that economic growth is possible with lower energy consumption. The aforementioned study was one of the first attempts to propose a holistic solution, and this consisted of renewable energy and energy efficiency. In 1991, the Feed-in Act (*Stromeinspeisungsgesetz*) was adopted, providing for the first feed-in tariffs and stipulating that green power had a priority over conventional power. The liberalisation of the German power market in 1998 brought about the notion that power firms and grid operators had to be legally separate entities. This meant that new power providers of renewables could go into business selling only green electricity. Subsequently, an eco-tax was added to the price of a litre of gasoline and of a kilowatt-hour of fossil-based electricity, resulting in greater sales of fuel-efficient cars and slightly lower overall consumption. The most relevant pieces of legislation in terms of energy transition were drafted in 2000 and thereafter, and energy transition remains a topic high on the agenda of German politics. The experience of

70 See http://energytransition.de/2012/10/renewable-energy-act-with-feed-in-tariffs/, last accessed 10 February 2015.

71 Hinz (2011:86).

72 UNEP (2012:10).

the past two decades shows that the fixed tariffs of the German system contributed to the increase in the market share of wind, solar and biomass power. In 2011, more than 300.869 GWh (Gigawatthours) have been produced by renewable energies, which is a share of 12,5% of total energy consumption (compared to 11,2 in 2010, 3,9 in 2000 and 1,9 in 1990).[73] This translates to an avoidance of 130.108 thousand tons of GHG emissions.[74] Renewable energies have matured substantially, become more reliable and cheaper than expected:

> The share of renewable electricity in Germany rose from 6% to nearly 25% in only ten years. On sunny and windy days, solar panels and wind turbines now increasingly supply up to half the country's electricity demand, which no one expected just a few years ago. Recent estimates suggest that Germany will once again surpass its renewable electricity target and have more than 40% of its power from renewables by 2020. [75]

Besides ensuring more energy security and reducing the risks of nuclear power, further objectives of energy transition include climate change mitigation, the reduction of energy imports, strengthening technology innovation and a green economy, and providing more social justice.

8.2 Sketching the Relevant Legal and Policy Framework for Energy Transition in Germany

Energy transition in Germany is founded on a number of relevant pieces of laws, regulations and policy, aiming to provide for green and sustainable energy, energy efficiency and energy security. A recent study[76] reveals that:

> In 2014, there were positive developments in many key areas. For the first time ever on an annual basis, renewables were the most important source of electrical energy in the power mix in Germany, ousting lignite coal from first place with a 27.3 percent share of German energy usage. At the same time, electric power consumption fell by 3.8 percent – a sign that investments in energy efficient appliances and manufacturing systems are paying off, as the German economy grew fairly strongly at 1.4 percent. Owing to the favourable developments in renewable energy and electricity usage, the climate-adverse use of hard coal for power production sank to its second-lowest level since 1990. Together with a mild winter, this led to a considerable decrease in CO_2 emissions from electricity, which now are at their lowest level since 1990.

These are, of course, very positive developments for the environment and the achievements in the RE sector. However, one should not lose sight of the fact that

73 Bundesministerium für Umwelt, Naturschutz und Reaktorsicherheit (2012:15).
74 (ibid.:14).
75 Craig & Pehnt (2014).
76 Agora Energiewende, 2015, "The Energiewende in the Power Sector: State of Affairs 2014", http://www.agora-energiewende.org/topics/the-energiewende/detail-view/article/trendwende-in-der-energiewende/, accessed 8 January 2015.

"fossil-fuel energy sources continue to dominate in the heating, industrial-process-heat and transport sectors".[77]

One important legal foundation of the *Energiewende* in the turnaround sketched above is the development of renewable energy-related legislation in Germany. In 2000, the Feed-in Act was replaced by the Renewable Energy Act (*Erneuerbare Energien Gesetz, EEG*), which is the centrepiece of green energy legislation in Germany and which has been subject to amendments in 2004, 2009, 2012 and 2014. Furthermore, the German government together with German industry paved the way to phase out nuclear power plants. Since then, the annual gross electricity production from renewable energies has increased from 36,0 terawatt hours in 2000 to 150,9 terawatt hours in 2013,[78] while the annual gross electricity production from nuclear resources has decreased from 169,6 terawatt hours in 2000 to 97,3 terawatt hours in 2013.[79]

The *EEG* sets out that renewables have priority on the grid (the priority principle).[80] Network operators are required preferentially to feed electricity generated from renewable energy facilities into the grid over electricity from conventional sources (nuclear power, coal and gas). The Act provides for investment protection through guaranteed feed-in tariffs; and a market premium system was recently included. Investors in renewables must receive sufficient compensation to provide a return on their investment irrespective of electricity prices on the power exchange. The *EEG* envisages that renewable energy technologies will become more efficient and less costly.

Section 1 of the *EEG* sets out the objectives of the Act, namely to facilitate sustainable development of energy supply; to reduce the costs of energy supply to the national economy; to conserve fossil fuels, on the one hand; and to promote the further development of technologies for the generation of electricity from renewable energy sources, on the other hand.

Renewable energy installations must always be subject to priority treatment. This is provided for in Sections 5 and 8 of the *EEG*: Grid system operators are obliged to connect to the grid immediately, and as a priority, those installations generating electricity from renewable energy sources. Subsequent to the connection of the installation to the grid, the priority principle is extended to the purchase, transmission and distribution of electricity generated in renewable energy installations. Grid system operators are obliged to purchase, transmit and distribute immediately and as a priority the entire available quantity of electricity from renewable energy sources (Section 8 of the *EEG*). A deviation from this principle is permissible under the conditions of Section 8 para. 3, namely where installation operators and grid system operators agree by contract to deviate from the priority purchase and this agreement serves to achieve a better integration of the installation into the grid system. Moreover, the grid system operators

77 Ruchser (2015).
78 See Bundesministerium für Wirtschaft und Energie (2014).
79 See Arbeitsgemeinschaft Energiebilanzen e.V. (2014).
80 For a more detailed discussion, see for example Lüdemann (2011) and also Büsgen & Dürrschmidt (2009).

are allowed to reduce the capacity of wind power installations in the case of an overload of grid capacity because of strong winds and low electricity demand.

A scheme of legally fixed tariffs for suppliers is established in which specific compensation depends on various factors: the source of energy; the electrical capacity of installations; the commissioning date; and, in the case of wind power technologies, also the location of the installation.[81] Section 16 of the *EEG* provides for the entitlement to payment of tariffs and is the fundamental provision of the compensation system. Operators of renewable energy installations are entitled to a payment for electricity generated in installations exclusively utilising renewable energy sources. Tariffs are calculated according to Sections 18, and Sections 23 to 33 of the *EEG*, which regulate the specific tariffs for the different renewable energy sources. Annual tariff reductions are possible, according to Section 20 of the *EEG* to reflect the technological progress and cost reductions owing to economies of scale and to encourage manufacturers to take these developments continuously into account.[82]

Direct selling has been made possible pursuant to Sections 33a to 33i of the *EEG*. Installation operators are allowed to sell electricity generated in installations exclusively utilising renewable energy sources or mine gas to third parties under certain conditions.

The EEG sets out a balancing and equalisation mechanism in relation to the quantity of renewable electricity distributed by the grid system operators and the tariffs paid in accordance with Section 16 of the *EEG*. This is regulated in Sections 34 to 44. These measures ensure that grid system operators in areas with high shares of renewable energy sources are disburdened so that regional disparities with regard to the quantities of renewable electricity as well as the costs attached thereto are prevented. By means of the equalisation scheme, the amount of electricity from renewable energy sources and the financial burdens relating to the remuneration are equally distributed according to the respective electricity consumption in each transmission grid.

The cost of the feed-in tariffs regulated under the *EEG* is passed on to power consumers. The price of wholesale power is reduced from the cost of renewable power, and the difference is passed on as the surcharge (*EEG Umlage*). In 2015, this surcharge raises the retail price by around 6,17 Euro cents per kilowatt hour.[83] The *EEG* surcharge is subject to debate and is increasingly becoming a social policy issue, particularly because industry not only generally pays wholesale rates, rather than retail rates, but energy-intensive industry and the railway sector in particular are largely exempt from the *EEG* surcharge. Thus, consumers and small businesses currently cover an inordinate share of the cost of green power.[84]

81 Mäger & Uwer (2007:200).

82 Langniβ et al. (2009:1290); Mäger & Uwer (2007:200).

83 See http://www.stromanbietervergleich.net/stromanbietervergleich-blog/148-strom-faellige-umlagen-2015.html, accessed 6 January 2014.

84 Morris & Pehnt (2014:37).

The Heat-Power Cogeneration Act (*Kraft-Wärme-Kopplungsgesetz, KWKG*), which was adopted in 2002 together with two subsequent amendments is the most important instrument to support combined heat and power.

In order to implement European Community Law and to ensure efficient, economical, user-friendly and ecological capacity-related supply of electricity and gas to the general public, the German Energy Economy Law (*Energiewirtschaftsgesetz, EnWG)* was enacted in 2005. According to the Act, power supply companies are obligated to provide a safe, reliable and efficient power supply grid.

In 2008, the Renewable Energies Heat Act (*Erneuerbare-Energien-Wärmegesetz, EEWärmeG*) was enacted and entered into force in January 2009, which, *inter alia*, provides that in new buildings part of the energy for heating purposes has to be supplied from renewable energies.

In 2009/2010, the EU Emission Trading Scheme (EU-ETS), which had been launched in 2005, was revised, aiming to cap the emissions in different sectors.

Atomic energy, criticised, *inter alia*, for the risk of accidents, incidents and terrorist attacks, as well as for possible ecological, financial and health problems related to the final disposal of high-level radioactive waste and removal of old nuclear power plants, but producing large amounts of energy and comparatively low GHG emissions, experienced a turning point with the nuclear accident in Fukushima in 2011, which caused the German government to adopt a rushed phase-out of nuclear power. Forty per cent of nuclear generating capacity (eight of the country's 17 reactors) was switched off for good within a week, with the last plant to be shut down roughly in 2022. This interim decision was taken on the basis of § 19 para. (3) subpara. 3 of the Atomic Energy Act (*Atomgesetz*), which provides that:

> the supervisory authority may order that a situation be discontinued which … may constitute a hazard to life, health or property because of the effects of ionising radiation. In particular, the supervisory authority may order that …
>
> 3. the handling of radioactive material, the erection and operation of installations of the kind referred to in § 7 and § 11, para. (1), subpara. 2, as well as the handling of installations, equipment and devices of the kind referred to in § 11, para. (1), subpara. 3, shall be suspended or, if a requisite licence is not granted or is definitely revoked, discontinued.[85]

The decision to shut down the reactors created a controversy: operators of nuclear power plants argued that Fukushima had not changed the condition of German nuclear power plants. Nevertheless, the respective resolutions were implemented – this was a political decision in response to seething public opinion following the Japanese

85 See § 19 (3) of the Act on the Peaceful Utilisation of Atomic Energy and the Protection against its Hazards (Atomic Energy Act) Edition 08/13 (bilingual) http://www.bfs.de/de/bfs/recht/rsh/volltext/A1_Englisch/A1_08_13_AtG_0514.pdf, last accessed 4 January 2014.

nuclear disaster. Subsequently, the Atomic Energy Act has been amended in order to give permanent effect to the shutdowns of nuclear power plants in Germany.[86]

8.3 Some of the Challenges Ahead

Subsequent to the nuclear accident of Fukushima, many Germans were in favour of pulling out of nuclear energy and moving towards climate-friendly energy production. For quite some time, Germany with its *Energiewende* was considered to be a pioneer in terms of climate protection. This admiration, however, seems to be fading as GHG emissions in Germany are increasing instead of decreasing, and concerns about rising prices, the loss of jobs in the lignite industry, and the security of energy supply are casting some clouds over the ambitious aims of energy transition in Germany. One of the reasons for the partial stagnation of the *Energiewende* is rooted in the EU Emission Trading Scheme (EU-ETS) with its 'cap-and-trade principle', which provides that the amount of allowed carbon emissions is limited and reduced on a yearly basis and allowances can be bought in the form of certificates from emitters who own unused certificates. Thus, CO_2 has been allocated a price. Inefficient energy producers, particularly those producing climate-damaging fossil fuels, have to buy more certificates than those operating more climate-friendly plants. In 2010, the Special Energy and Climate Fund, the first German efficiency fund, was created and funded by revenue from carbon emission certificates. The EU-ETS, however, continues to receive criticism. While it was hoped that nuclear power production would be replaced by low-emission gas and renewable energies, reality shows that, owing to the relatively cheap price for carbon, GHG emissions remain higher than expected. While this system worked well in the beginning, the prices for carbon trading started to collapse owing to the financial crisis in Europe and the concomitant surplus of certificates. Furthermore, large quantities of emission certificates from Russia, the Ukraine and China, which the EU had admitted into its emission trading scheme (ETS) have overstocked the market, among which cheap certificates with no corresponding emission reductions. With the low price for CO_2, brown coal displaces coal, and black coal displaces gas, the much more climate-friendly but more expensive source for energy production.

With the ambitious decision of the European Council in October 2014 to reduce GHG emissions by 2030 by 40% compared to the 1990 level; to increase the share of renewables; and to enhance energy efficiency to 27%, a revision of the ETS is imperative, but will take some time. In the meantime, it is expected that in the course of 2015, a new law will be enacted in Germany, defining a CO_2 budget for the energy sector in order to meet the EU requirements.

What is noteworthy is that, recently, energy industry in Germany expidites to some extent green environmental policy. While energy transition has long been a project primarily in the hands of German politicians, it seems now that the industry is creating

86 See Winter (2012:234).

precedents to put an end to the fossil fuel era.[87] It can be observed that the turnout of green electricity providers, such as Lichtblick, are constantly increasing and the pillars of conventional energy are shaking. One of the four main energy companies in Germany, namely E.ON, has announced via its new corporate strategy that it will gradually quit conventional energy, spinning off its nuclear, oil, coal and gas operations to focus entirely on renewables.[88] The Swedish energy provider Vattenfall, with major lignite operations in Germany, has announced plans to sell its lignite mines and coal-fired power plants situated in the Lausitz – a decision made when Germany[89] emphasised that Vattenfall's future must lie in the development of renewable energy and not in coal and gas. It remains to be seen, however, whether these mindshifts of major energy producers will really result in more clean energy and fewer GHG emissions, or whether the problem will just be passed on to new proprietors, since it appears that conventional energy businesses are being sold rather than being shut down.

A further challenge with a more technical focus is to integrate the electricity generated by decentralised renewable energy power plants into the existing electricity grid structure. Existing grids were built in accordance with the centralised energy system of the four main energy companies in Germany (E.ON, Vattenfall, RWE and EnBW). With an increase of clean energy production, an urgent need arises to adapt the grid infrastructure. The storage of electricity produced from renewables so that electricity can be fed in as needed is probably of paramount importance – not only in Germany. Storage capacity for electricity is vital to expand renewables in Germany's power supply.[90] Storage options such as batteries, pumped water, small-scale distributed hydrogen or compressed air are necessary to cover for solar photovoltaic and onshore wind energy during periods of uncooperative weather, and to obviate reliance on coal-fired plants to back up renewables. Proper storage is also required to stabilise the growing supply of renewable energy in Germany's system.

87 See also Ruchser (2015).

88 See E.ON (2014).

89 See Vattenfall (2014).

90 A recent study by Agora Energiewende (2014) has, however, concluded that significant storage capacity for renewably generated electricity (power-to-power storage) would not be needed for the next 15 to 20 years – until Germany has at least a 60% share of renewables in its power sector. According to the study, Germany's energy system can maintain the flexibility it needs even as renewables expand by other means than costly new power-based storage technology. Alternative options include demand-side management, flexible conventional power plants, and grid expansion both in Germany and across its borders. Germany's current grid and the expansions underway will provide the flexibility necessary to accommodate more renewables.

9 Legal Aspects of Energy Security and Renewable Energies in South Africa

9.1 Energy Supply in South Africa[91]

- South Africa has a large energy-intensive coal mining industry. The country has limited proved reserves of oil and natural gas and uses its large coal deposits to meet most of its energy needs, particularly in the electricity sector. South Africa also has a sophisticated synthetic fuels industry, producing gasoline and diesel fuels from the Secunda coal-to-liquids (CTL) and Mossel Bay gas-to-liquids (GTL) plants.
- PetroSA, a South African state-owned company, operates upstream oil and natural gas producing assets in South Africa, along with the GTL plant in Mossel Bay. Sasol, a privately-owned company based in South Africa, operates the Secunda CTL plant, has a majority interest in the Natref oil refinery, partially owns the pipeline transporting natural gas from Mozambique to South Africa, and is involved in coal mining.
- South Africa has the world's ninth-largest amount of recoverable coal reserves and holds 95% of Africa's total coal reserves. Environmental groups continue to target the industry for air, land, and water pollution. However, coal consumption in South Africa is expected to continue to increase as new coal-fired power stations are scheduled to come online in the next few years to meet rising demand for electricity.
- South Africa exports roughly 25% of its coal production. The Richards Bay Coal Terminal, the country's main coal export terminal, is one of the world's largest. In 2013, the terminal received and exported more than 70 million tons of coal for the first time. India and China are the largest importers of South African coal.
- South Africa imports natural gas from Mozambique via pipeline to supply Sasol's Secunda CTL plant and to fuel some gas-fired power plants. South Africa produces a small volume of natural gas offshore, and it is mainly used to supply the Mossel Bay GTL plant.
- EIA estimates that South Africa holds 390 trillion cubic feet (Tcf) of technically recoverable shale gas resources. Environmental concerns led the government to place a moratorium on shale gas exploration from April 2011 to September 2012. In October 2013, the government released proposed new regulations to govern the exploration of shale resources. International companies are still waiting to be issued permit licenses for shale exploration.
- South Africa has small amounts of proved crude oil reserves, and the country's crude oil production is very small. Synthetic fuels, derived from coal and natural gas, account for almost 90% of the country's domestic petroleum production.
- South Africa consumes the second-largest amount of petroleum in Africa, behind Egypt. The petroleum consumed in South Africa comes mostly from its domestic refineries that import crude oil and its CTL and GTL plants. South Africa imports crude oil mostly from OPEC countries in the Middle East and West Africa, with roughly half imported from Saudi Arabia in 2013.

91 The following information is taken from the US Energy Information Administration http://www.eia.gov/countries/country-data.cfm?fips=sf, last accessed 15 January 2015.

- South Africa's electricity system is constrained as the margin between peak demand and available electricity supply is very small. In November 2013, Eskom requested that its largest industrial customers cut their electricity consumption by 10% during peak demand times.

9.2 Energy Security and the Role of Renewable Energies in South Africa

Energy security is a very sensitive issue in South Africa, especially in recent times. South Africa is in the midst of a severe energy crisis affecting the South African economy and thus the people. The key player[92] in the debate around energy security in South Africa is the largest producer of electricity in Africa, Eskom, an electricity public utility, which generates, transmits and distributes approximately 95% of electricity used in South Africa and approximately 45% of the electricity used in Africa.[93] To date, Eskom, with its generation, transmission and distribution divisions, is responsible for the management of the South African power grid.

Energy supply in South Africa is unstable. Eskom has repeatedly implemented load shedding, i.e. the interruption of power supply to certain areas, owing to a lack of electricity to meet the demand of all Eskom customers. Load shedding has been and will continue to be implemented throughout the country on a rotating schedule as a measure to resolve the company's financial problems.[94] Cabinet was briefed by Eskom, on what would happen if the grid failed and electricity supply shuts down indefinitely, i.e. the risk of a nationwide blackout.[95]

While some have argued that bad leadership is responsible for the energy crisis in South Africa,[96] President Jacob Zuma has shifted the blame for the country's energy crisis to the former apartheid regime.[97] There are various options to address the critical energy situation in South Africa. As can be seen from the graph below on primary energy consumption in South Africa in 2013, renewable energies could play a more prominent role in South Africa's energy mix, considering that South Africa is a country with high wind speeds and famously bright sun, a source of energy which is particularly

92 A draft called the Independent System Market Operator (ISMO) Bill, which would have taken the management of South Africa's national power grid away from Eskom, allowing greater involvement of independent power producers (IPPs), has been abandoned by South Africa's ruling party, the ANC in January 2015.

93 According to company information, see http://www.eskom.co.za/OurCompany/CompanyInformation/Pages/Company_Information.aspx, last accessed 12 February 2015.

94 See Steyn (2015).

95 Zille (2015).

96 This may be inferred, for example, from the opposition's party's statements, such as a speech delivered by Mmusi Maimane, deputy federal chairperson of the Democratic Alliance and parliamentary leader of the Democratic Alliance during a debate on the escalating crisis at Eskom. See Maimane (2014).

97 See Hunter (2015).

important for those who do not have access to the national grid. Despite the abundance of renewable energy sources, the renewable sector is battling with South Africa's powerful coal industry. South Africa is the world's seventh-largest coal producer.[98] With the ongoing energy crisis, however, it is desirable and very likely that the renewable energy sector will expand in the near future. In order to end the electricity crisis soon, it has been suggested that the country should "re-look our ideal energy mix, taking the fast-changing energy landscape into account. And by this, I mean a far, far greater allocation to renewable energy sources."[99]

Steps to put an end to the energy crisis in South Africa have to be taken rather sooner than later as negative impacts on economic growth and international competitiveness of the country as a result of load shedding are already being felt: South Africa's important and energy-intensive mining industry is strongly affected by the planned power blackouts, which have

> led to a strong depreciation of the rand as well as a stalling of economic growth and downward revisions in growth forecasts. Several ratings agencies have also downgraded the country's credit rating, which has had a negative impact on the outlook of the country as an investment destination ... approximately 1–2% of GDP could potentially be wiped out per month of load shedding. [100]

Figure 1 below underlines that an urgent need for the promotion of renewable energies exists in order to achieve a balanced and sustainable energy mix for South Africa's future.

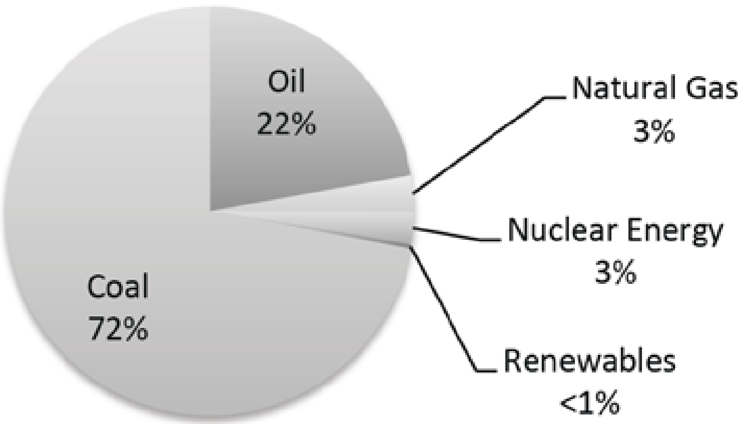

Figure 1: Total Primary Energy Consumption in South Africa, 2013
Source: Compiled by author based on figures from BP (2014).

98 With a share of total production of 3,7%, after China with 47,4%, the US with 12,9%, Australia with 6,9%, Indonesia with 6,7%, India with 5,9% and the Russian Federation with 4,3%. See BP (2014:32).

99 Zille (2015). Apart from this, Zille suggests that the protected monopoly of Eskom be lifted, that the performance bonuses paid out to Eskom executives be returned; and that the nuclear procurement programme be abandoned and thus the R1 trillion nuclear deal.

100 Van der Nest (2015).

9.3 Relevant Legal and Policy Framework for Renewable Energies in South Africa

So far, the legal and policy framework for renewable energies in South Africa is varied and patchy, and there is a need for action to streamline and harmonise the regulatory framework for renewable energies.[101] While work on a number of recent legislative, regulatory and planning process developments has picked up speed, progress in renewable energy implementation and follow-up strategies is slow.[102] This is ultimately resulting in a low level of urgently required investments – which in turn hampers the achievement of objectives as set out in the various policy instruments.

9.3.1 Legislation

In addition to some constitutional provisions, especially the right to an environment that is not harmful to health or well-being, as laid down in Section 24 and provisions relating to environmental management,[103] matters relating to renewable energy also fall under the general environmental framework legislation, with the National Environmental Management Act 107 of 1998 (NEMA) leading the way. The National Energy Act 34 of 2008[104] is the most relevant statutory law with regard to renewable energy. But other pieces of legislation might also be directly or indirectly applicable, including, among many others, the Electricity Regulation Act 4 of 2006; the Mineral and Petroleum Resources Development Act 28 of 2002 (MPRDA); the Atmospheric Pollution Prevention Act 45 of 1965, and the Conservation of Agricultural Resources Act 43 of 1983.

The essential legal provisions regarding energy planning are set forth in the National Energy Act 34 of 2008 that was signed into law in 2009 and which seeks to ensure energy security, i.e. that diverse energy resources are available in sustainable quantities and at affordable prices. Although renewable energies generally fall within the scope of the National Energy Act, the Act is not able to provide legal security for producers and investors in the field of renewable energies.[105] Although the Act provides for energy planning and increased generation and consumption of renewable energies, renewable energies are not expressly mentioned in the Act's objectives in Section 2.[106] Renewable energies are only mentioned in Section 19, which refers to general regulations the Minister may make, including regulations regarding the minimum contributions to national energy supply from renewable energy sources, as well as regulations regarding

101 See Trollip & Marquard (2014); ASSAf (2014); Lüdemann (2012); and Glazewski (2005).

102 See Trollip & Marquard (2014).

103 Energy matters generally, and renewable energy in particular, are by default national matters administered by the national Department of Mineral Affairs and Energy (DME). See Glazewski (2005:3).

104 National Energy Act No. 34 of 2008, Government Gazette No. 31638, 24 November 2008.

105 See Lüdemann (2012:317).

106 Section 2(b) National Energy Act.

measures and incentives designed to promote the production, consumption, investment, research and development of renewable energy.[107] The Minister has the discretion comprehensively to introduce measures in favour of renewable energies. However, neither concrete measures to promote renewable energies have been prescribed, nor have minimum contributions of renewable energies to the national supply mix been stipulated in the Act.

Another important piece of South African legislation pertinent to renewable energies is the Electricity Regulation Act No. 4 of 2006 as amended by the Electricity Regulation Amendment Act 28 of 2007.[108] Among others, the Act aims to "achieve the efficient, effective, sustainable and orderly development and operation of electricity supply infrastructure in South Africa"; and to "ensure that the interests and needs of present and future electricity customers and end users are safeguarded and met". The Act does not explicitly refer to renewable energies but is still relevant, as it also aims at promoting the use of diverse energy sources and energy efficiency. Most importantly, the Act will be applicable for all sorts of licences required for producers of renewable energies and for the relationship between the Regulator as defined by the Act and established by Section 3 of the National Energy Regulator Act[109] and licensees.

9.3.2 National Policies

The national policy framework, which is directly or indirectly relevant to promoting renewable energies, is widely spread throughout the South African policy landscape across different branches of government.[110] However, most relevant for renewable energies are two white papers, namely the 1998 White Paper on Energy Policy and the 2003 White Paper on Renewable Energy.[111]

South Africa's sources of renewable energy have been listed in Chapter 4 of the 1998 White Paper, namely solar, wind, and biomass (firewood, wood waste, dung, charcoal and bagasse) energy; hydro power; and biogas and landfill gas. The 1998 White Paper has identified the main objectives for the energy sector as being access to affordable energy services; improving energy governance; stimulating economic development; managing energy-related environmental impacts; and securing supply through diversity.

107 Section 19(d), (f) National Energy Act.

108 Available from http://new.nersa.org.za/SiteResources/documents/Electricity%20Regulation%202006(%20Act%20No%20%204%20of%202006)%20as%20amended%20by%20the%20Electricity%20Regulation%20Amendment%20Act2007(%20Act%20No%20%2028%20of%202007).pdf, last accessed 28 January 2015.

109 National Energy Regulator of South Africa (NERSA) has been established in terms of the National Energy Regulator Act of 2004, and is mandated to regulate South Africa's electricity, piped gas and petroleum industries and to collect levies from people holding title to gas and petroleum.

110 For a comprehensive outline of the legal and policy framework relating to green technologies, see ASSAf (2014:47ff.).

111 Available at http://www.energy.gov.za/files/policies/whitepaper_renewables_2003.pdf, last accessed 27 January 2015.

Renewable energies are addressed in that the 1998 White Paper specifies that with a view to long-term issues and a more sustainable energy mix, government must improve its ability to address the development of renewable energy resources.[112] The establishment of suitable renewable energy information and the development of standards and codes of practice for the correct use of renewable energy systems are medium-term priorities.[113] The White Paper aims to to ensure that economically feasible renewable energy technologies are implemented and that an equitable level of national resources is invested in renewable technologies.[114]

In the spirit of the World Summit on Sustainable Development, hosted by South Africa in 2002, the White Paper on Renewable Energy was launched in 2003 with a variety of measures designed to bring about integration of renewable energies into the mainstream energy economy. The expansion of renewable energy has been formulated as one policy goal in conjunction with a commitment to diversifying the power market and promoting private investment in renewable energy.

A target of a 10 000 GWh (0,8 Mtoe) renewable energy contribution to final energy consumption by 2013 has been formulated in this policy, to be produced mainly from biomass, wind, solar and small-scale hydro sources.[115] The renewable energy is to be utilised for power generation and non-electric technologies such as solar water heating and biofuels. The 2003 White paper recognises sustainable development, an enabling environment, and specific institutional arrangements as being key for renewable energy implementation; and underlines the need for creating an enabling environment through the introduction of fiscal and financial support mechanisms within an appropriate legal and regulatory framework.

Financial and legal instruments, technology development, awareness raising, capacity building, and education are identified in the 2003 White Paper as key strategic areas to create an enabling environment. Goals, objectives and deliverables are laid down for each strategic area. The long-term goal of the 2003 White Paper is to establish a fully non-subsidised alternative to fossil fuels and to attain full competitiveness of the renewable sector.[116] To this end, government has committed itself in the 2003 White paper to develop, implement, maintain and continuously improve an effective legislative system to promote renewable energies;[117] to develop an appropriate legal and regulatory framework for pricing and tariff structures to support the integration of renewable energy into the energy economy; to attract investment in the renewable energy sector;[118]

112 Republic of South Africa (1998:25).

113 (ibid.:29).

114 (ibid.:79).

115 Looking at the figures from BP on renewables consumption for South Africa, it is evident that this target has not been achieved. For 2013, only 0,1 million tonnes of oil equivalent are attributed to renewable energy consumption. See BP (2014:38).

116 Meyer & Odeku (2009:51).

117 Republic of South Africa (2003:33).

118 (ibid.).

and to foster the integration of independent power producers that feed renewable energy sources into the existing electricity system.[119]

The 2003 White Paper states that a strategy on renewable energy is to be developed, which will translate the goals, objectives and deliverables of the White Paper into a practical implementation plan.[120] However, more than 10 years after the launch of the 2003 White Paper, this strategy has so far not been developed.

9.3.3 Other Regulatory Measures

The Energy Efficiency Strategy[121] was released by the Department of Minerals and Energy in 2005 in support of the 1998 White Paper on Energy Policy, to

> encourage sustainable energy sector development and energy use through efficient practices, thereby minimising the undesirable impacts of energy usage upon health and the environment, and contributing towards secure and affordable energy for all.[122]

The Strategy, which is currently under review, stipulates a final energy-demand reduction of 12% by 2015, as measured against the national energy usage projected for that year. The Department of Mines and Energy has included the aims of the Energy Efficiency Strategy in the drafting of subsequent policy documents aimed at ensuring energy security, such as the 2007 Energy Security Master Plan – Electricity 2007–2025 and the 2008 National Response to South Africa's Electricity Shortage.[123]

In March 2011, the Integrated Resource Plan 2010 (IRP) was promulgated to help to minimise greenhouse gas emissions related to fossil fuels and to boost job creation. The Department of Energy released the IRP 2010–2030,[124] a 20-year capacity addition plan for the electricity sector. The plan marks a twenty-year projection on electricity supply and demand in the country, and takes into account the import and export of power. In terms of the IRP, about 42% of the electricity generated in the country is required to come from renewable resources.

After a round of public participation was conducted near the end of 2010, several changes were proposed and a second Policy Adjusted IRP was recommended and adopted by Cabinet in March 2011. The IRP sets ambitious targets, one of which is to install an additional renewable-energy generation capacity of 17 800 megawatts by 2030. The 2010 IRP, however, indicates that it should be a 'living plan' which is revised by the Department of Energy every two years. The IRP 2010 has thus been updated.[125] To date,

119 (ibid.).
120 (ibid.:43).
121 Available at http://www.energy.gov.za/files/esources/electricity/ee_strategy_05.pdf, last accessed 25 January 2015.
122 See Vision of the Strategy.
123 For a detailed analysis see Rosenberg & Winkler (2011).
124 See Republic of South Africa (2011a).
125 The updated version is available at http://www.doe-irp.co.za/content/IRP2010_updatea.pdf, last accessed 28 January 2015.

no approved document has been promulgated and published in the *Government Gazette*.

The National Energy Regulator of South Africa (NERSA) started a consultation process for the introduction of a feed-in tariff system as policy instrument to support renewable energy technologies in 2008 and in order to attract developers and investors. The final Renewable Feed-in Tariffs (REFIT) decisions were published in 2009, as well as the NERSA regulatory guidelines on the REFIT system.[126]

The South African REFIT scheme provided for concrete tariffs which guaranteed purchase prices for a fixed amount of time. The tariffs were designed to cover the costs of generation plus a reasonable return on investment.[127] As both the cost structures and the investment environment vary according to the different renewable energy technologies, different tariffs had to be calculated for each single technology. The tariff system included, among others, on-shore wind, small hydro, landfill gas, concentrating solar power, solid biomass, biogas and solar photovoltaic systems.[128] The tariffs adopted by NERSA in 2009 ranged from R0,90/kWh for landfill gas up to R3,94/kWh for large-scale grid-connected photovoltaic systems.[129] Investors and environmental organisations were satisfied with the tariff levels designed by NERSA as, after accounting for generation cost, the tariffs would have provided investors with an approximate return on equity of 17%.[130]

The term for the tariffs was to be applicable for 20 years and the adopted tariffs not subject to degression. The tariffs were subject to an annual review for the first five-year period of implementation and every three years after this period. Should the review process have resulted in the need to adjust the tariffs, these would only have been applicable to new projects.

Further regulations supporting the market introduction of renewable energy technologies were contained in NERSA guidelines and decisions.[131] The NERSA guidelines contained qualification criteria for renewable energy generators and set out that all renewable energy producers have the responsibility to ensure that their power production makes use of credible renewable energy sources. It was furthermore provided that if a producer of renewable energies wanted to participate in the REFIT regime, such producer needed a generation licence issued by NERSA under the Electricity Regulation Act No. 4 of 2006. The licence was subject to specific conditions including the termination conditions in case of non-compliance on the production of renewable energy. NERSA guidelines furthermore contained comprehensive monitoring and reporting obligations for the Regulator, the generators and the Renewable Energy Purchasing Agency (REPA).

Most importantly, NERSA has decided on a purchase obligation, following a single-buyer approach, like in many other countries, to avoid complexity in the initial phase.

126 Lüdemann (2012:317).

127 (ibid.).

128 (ibid.:318).

129 NERSA (2009a).

130 Eberhard (2013); Pegels (2010).

131 NERSA (2009b); Lüdemann (2012:318).

The REPA, to which the Eskom Single Buyer Office has been appointed, was obliged to enter into a power purchase agreement (PPA) with renewable energy generators and to make payment for renewable energy generated and supplied under REFIT. The difference of the cost of the energy purchased under REFIT and the avoided cost for the same amount of energy acquired through another means would have been borne by all Eskom electricity customers through existing 'pass-through' arrangements for equalising the costs of independent power production. The NERSA guidelines furthermore provided for a guarantee for renewable energy generators to get access to either the distribution or the transmission networks, as appropriate. The renewable energy generator had to bear the costs for the grid connection.

Despite the attractive 2009 tariff levels, a standstill in renewable energy investments could be observed. In 2011, NERSA released a paper with revised tariffs for review, in which tariffs had been greatly reduced compared to the 2009 tariffs.[132] This, of course, shook the confidence of RE project developers in investment climate stability. NERSA delayed official feed-in tariff announcements, which in turn put increasing stress on project developers, who had already started project development processes under the generous 2009 REFIT rate assumptions. Furthermore, the legality of the REFIT programme was questioned as being unconstitutional by the National Treasury, which believed that fixed tariffs were neither competitive nor cost-effective, and thus not in line with Section 217 of the South African Constitution of 1996.[133] In May 2011, the Department of Energy published conflicting new generation regulations,[134] which had made no mention of the REFIT. In August 2011, in an about-face, a competitive bidding process, known as the Renewable Energy Independent Power Producer Procurement Programme (REIPPP) was launched, an approach contradictory to the REFIT.[135]

132 See NERSA (2011).

133 For a detailed discussion, see Pegels (2011).

134 Electricity Regulations on New Generation Capacity, available at http://www.energy.gov.za/files/policies/Electricity%20Regulations%20on%20New%20Generation%20Capacity%201-34262%204-5.pdf, last accessed 29 January 2015.

135 At the launch, the director general with regard to the further fate of the REFIT explained the following: "The Renewable IPP Programme is not a replacement for the Renewable Energy Feed-In Tariff (REFIT) Programme. As you may be aware, the department, together with the National Energy Regulator of South Africa (NERSA), launched the REFIT Programme years ago under the provisions of the Electricity Regulation Act of 2006. After several attempts, it became clear that the current Act does not provide the necessary requirements for the implementation of the REFIT Programme. It was only prudent for the department to take a responsible decision and implement another programme outside of the REFIT Programme, whilst dealing with the legal challenges associated with it. It was essential for the department to precede with the implementation of renewable energy initiatives to maintain credibility of the country. In due time, a REFIT Programme may be implemented depending on the successful amendment of the primary legislation to allow for execution of such a programme. I am of the view that the REFIT Programme will play a vital role in bringing small projects into the grid." See Renewable IPP Programme Speaking Notes for the DG, 31 August 2011, available at http://www.energy.gov.za/IPP/Aug%202011/Renewable%20IPP%20programme%20speaking%20

Under the Electricity Regulation Act of 2006, the REIPPP has been designed by the Minister in consultation with NERSA and in accordance with IRP 2010 to deliver by 2016 the target of 3 725 MW of renewable energy to start and stimulate the renewable energy industry in South Africa. According to the regulations issued by the Department of Energy, the system operator (Eskom) invites bids from independent power producers (IPPs), including renewable energy generators, for specified quantities of RE. Of the 3 725 MW to be procured in five different rounds and subject to the availability of the MW, 1 850 MW have been allocated for wind, 1 450 MW for solar photovoltaic, 200 MW for concentrated solar power, 12,5 MW for biomass, 12,5 MW for biogas, 25 MW for landfill gas, and 75 MW for small hydro.[136] Pursuant to a Ministerial determination in December 2012, a further 3 200 MW of renewables generation capacity was to be procured. According to a further Ministerial determination, an additional allocation of 308 MW was made available for bidding in the third bid window. Bidders have been invited to submit proposals containing details on the finance, construction, operation and maintenance of renewable energy generation facilities. Bidders are required to meet qualification criteria, among which legal, environmental and financial. If these criteria are met, the bid is evaluated on bid price and economic development objectives.[137]

The Department has received an overwhelming number of bids, representing more than double the capacity allocation of the first two bidding windows. In the first and second phases of the bidding process, 132 bids were received, and 47 have been chosen in a procurement process, representing 2 460 MW of renewable energy capacity. Relevant documents for the procurement process included a request for proposals, a power purchase agreement, and an implementation agreement. Within the REIPPP the fundamental contractual arrangements are thus threefold: A Government Framework Support Agreement between Eskom and Government, a Power Purchase Agreement between Eskom and the IPP, and an Implementation Agreement between the IPP and Government.

A status report from the Department of Energy released in 2014 reveals that in the first bid window, the total capacity connected to the grid is 651,94 MW and the total capacity still to be connected to the grid from the first bid window is 771,86 MW. With regard to the second bid window, most projects are at initial construction stage and will be complete around 2016.[138] A third bid window of the REIPPP has been announced in 2013, for which the Department of Energy awarded preferred bidder status to 17 projects.[139] The successful projects, totalling 1 456 MW, comprised seven wind projects (787 MW); six solar PV projects (450 MW); two solar thermal projects (200 MW); and, for the first time, one landfill gas and one biomass project (18 MW and 16,5 MW). The

notes%20for%20the%20DG.pdf, last accessed 29 January 2015.

136 See Republic of South Africa (2011b).

137 For some details on the procurement process see Republic of South Africa (2013).

138 See Republic of South Africa (2014).

139 See Republic of South Africa (2013).

successful projects will enter into PPAs with state-owned utility Eskom and receive guaranteed payments for 20 years.[140]

10 Energy Security and Renewable Energies in Namibia

10.1 Energy Supply and Institutional Framework

Figures on the total primary energy supply in Namibia reveal that

> oil products are the largest energy source with a share of around 70%. Second largest energy source is imported electricity (~15%). These figures include both imports and exports and show that Namibia is a net importer. After these two groups comes domestic hydropower, imported coal and produced biomass.[141]

According to the U.S. Energy Information Administration (EIA), the following figures apply to Namibia:[142]

Petroleum consumption	26,81 thousand barrels per day
Proved reserves of natural gas	2,20 trillion cubic feet
Production of coal	0,0 million short tons
Consumption of coal	0,013 million short tons
Net generation of electricity	1,80 billion kilowatt hours
Net consumption of electricity	3,80 billion kilowatt hours
Installed capacity of electricity	0,51 Gigawatt-electric

The power utility company of Namibia, NamPower, is state-owned. It is the country's overall electricity system operator and, as the national electricity generation and transmission entity, it is also responsible for all electricity trading into and across the borders (single buyer). Distribution is licenced to the Regional Electricity Distributors (REDs), in which NamPower is a minority shareholder.[143]

Namibia's Electricity Control Board (ECB) is the statutory regulatory authority established in 2000 under the Electricity Act 2 of 2000, which has subsequently been repealed by the Electricity Act 4 of 2007. The ECB exercises

140 See reegle (2014).

141 Rämä et al. (2013).

142 See http://www.eia.gov/countries/country-data.cfm?fips=WA&trk=m, last accessed 2 February 2015.

143 There are currently five REDs across the country: NORED, Erongo RED, CENORED, CENTRAL RED and Southern RED. The first three REDs are fully operational. In addition to the REDs, there are municipalities like the Windhoek Municipality involved in the distribution of power. Other bulk consumers like the mines are directly supplied by NamPower.

> control over the electricity supply industry with the main responsibility of regulating electricity generation, transmission, distribution, supply, import and export in Namibia through setting tariffs and issuance of licenses.[144]

As of 2012, electricity demand in Namibia was 662 MW.[145] Electricity is generated by four local power plants which feed the electrical energy into the transmission grid. They are the Ruacana hydro-electric power station on the Kunene River with a generation capacity of 332 MW and which contributed 99% of all locally generated electricity;[146] the coal-fired Van Eck power station north of Windhoek with a nameplate capacity of 120 MW; the Paratus fuel-oil power station at Walvis Bay with an electrical generation capacity of 24 MW; and Anixas, a heavy fuel-oil power plant at Walvis Bay with an installed capacity of 22,5 MW.[147] Further electrical energy is imported from neighbouring countries, mainly South Africa. In 2014, 4,384 GWh were fed into the system, of which 1 498 came from NamPower and 1 091 from South Africa's Eskom.[148] The overall percentage of imports from across-border suppliers amounted to 59% in the financial year 2013 to 2014.[149] Namibia is also exporting some of its generated energy to neighbouring countries, as was recently the case when surplus energy was available owing to the Ruacana Hydropower Station generating at full capacity (330 MW). Strong inflows (of up to 400 cubic metres/second) due to good rains in the catchment area of the Kunene River basin made this possible and, as part of an annual surplus sales agreement, NamPower exported the surplus to Eskom and the Botswana Power Corporation (BPC).[150]

There are some concerns about the future energy situation in Namibia. A recent study[151] has concluded that Namibia is facing a severe energy crisis and that the future demand for energy will exceed maximum supply levels resulting in power cut-offs and load shedding. The reason for this, the study states, is, on one hand, the dependence of Namibia on energy imports from South Africa, which is in the midst of a severe energy crisis itself, as outlined above, and, on the other, the reliance on the Ruacana hydro-electric power plant, which is prone to technical failures and depends critically on the availability of water in the Kunene River, which is unstable owing to varying rainfall and water use in southwestern Angola. Furthermore, there is no large-scale dam or reservoir at or near Ruacana. Projects to increase the energy supply in the country have been initialised and will transform Namibia's ability to generate electricity during the course of this decade and eventually allow the country to become an exporter of energy (from, for example, the Kudu gas-fired power station and further investments in hydropower and solar energy). However, many of the new projects will not be fully operational by

144 See website of the ECB, http://www.ecb.org.na, last accessed 3 February 2015.
145 RERA (2014:7).
146 See NamPower (2014:31).
147 See VO Consulting (2012:13).
148 See NamPower (2014:1).
149 (ibid.:32).
150 See NamPower (2015).
151 BMI (2015).

the end of this decade, so that the power supply until then remains precarious.

NamPower is currently developing the 800 MW (nominal) Kudu gas-fired power station, which will be located north of Oranjemund. The Kudu Power Station will be the first combined cycle gas turbine power station of this size in southern Africa and is expected to be commissioned by the end of 2017. Before the Kudu Power Station becomes operational, NamPower intends to attend to power supply shortages by applying its short-term critical supply initiatives, including

- demand-side management (DSM);
- Van Eck refurbishment;
- runners replacement at Ruacana Hydropower Station;
- negotiation of PPAs with regional utilities and IPPs; and
- the development of a 250 MW power plant.

> The 250 MW power plant will be a joint development with the private sector. The plant will fill the supply gap prior to the commissioning of Kudu and, thereafter, its operating regime has been designed to complement Kudu. [152]

Apart from the Kudu power plant, further projects to increase electricity production capacity are envisaged with a total capacity of more than 1 400 MW, most of them generating power from renewable energies.[153]

10.2 The Role of Renewable Energies in Namibia

Namibia's potential for the production of energy from renewable energies is outstandingly high[154] and *de facto*, renewable energies do already play a significant role in Namibia's energy mix, considering that currently 99% of all locally generated electricity is produced from hydropower (which should, of course, not obscure the fact that due to the high rate of energy imports, oil and oil products still have the biggest share, i.e. approximately 70%, in the total primary energy supply).

Renewable energies and energy efficient technologies, including wind power plants, solar power and solar photovoltaic technologies, and the use of biomass from invader bush resources (bush-to-electricity power plants) have an outstanding potential to alleviate Namibia's current electricity shortage and substantially contribute to the

152 See NamPower (2015).

153 See NamPower (2014:33ff.); Rämä et al. (2013:10).

154 Already, the 1998 White Paper on Energy Policy in Namibia states that "Namibia has abundant renewable energy resources. In addition to hydropower potential, solar radiation in Namibia is the highest measured so far in any country in the world (up to 3100 kWh/m2/year in certain areas) and excellent wind resources exist in coastal areas (6 to 8 m/s mean windspeed, measured at 10 m height above flat water surface). Both resources are at present virtually untapped. Biomass resources, on the other hand, are constantly being over-exploited. They contribute approximately 10% to Namibia's total net energy consumption and are mainly used by rural and peri-urban households". See GRN (1998:43).

development of Namibia's sustainable energy future.[155]

The promotion of renewable energies and energy efficient technologies is also an important aspect in terms of poverty reduction and could play an important role for rural electrification considering that the majority of rural households rely on biomass fuels to meet their energy needs. Although the rural electrification programme has extended electricity supply to some rural areas, rural electrification remains slow.[156] As measured by connection, access to electricity is only enjoyed by 30% of rural households and 70% of urban households.[157] The latest available *Population and Housing Census for Namibia*[158] reveals that 54% of households in Namibia rely on wood as the main source of energy for cooking, and about 33% on electricity from the national grid. 59% of urban households rely on electricity for cooking, while 86,2% of households in rural areas use wood to cook. The most common source of energy for lighting in Namibia is electricity from the main grid (42,3%); and 70,1% of the households in urban areas rely on electricity, while half of the households in rural areas use candles for lighting. Solar energy is not widely used, but plays a more important role in rural areas (2%) than in urban areas (0,4%). Wood is used in 75% of the households as heating material, while almost half (49,3%) of urban households are heated with electricity from the main grid. Only 6,5% of rural households use electricity from the main grid, and only a tiny proportion (0,3%) rely on electricity from generators and solar energy.

Against this backdrop, NamPower has launched a Renewable Energy Policy aimed at sourcing at least 10% of its energy mix from renewables other than hydro.[159] As a first step, NamPower (in collaboration with the Ministry of Mines and Energy and the Electricity Control Board) has been designated to manage a tender for 30 MW of solar PV to be provided by an independent power producer (IPP), as part of a broader programme to commission 94 MWs of IPP-generated power through a mix of solar and wind technologies.

In order to support and expand the utilisation of renewable energy resources and to

> ensure a secure supply of power to meet internal demand, based on the utilization of conventional and renewable energy resources, support the technological development of the new and renewable energy subsector and foster private sector investment in Grid-connected renewable energy resources through the creation of targeted incentives, including fiscal and other measures[160]

the ECB has invited all stakeholders to review and submit their comments on a document titled *Renewable Energy Feed-in Tariff (REFIT) for Namibia,*[161] as well as on the associated Guidelines and Application Procedures. NamPower has indicated that

155 See VO Consulting (2012:43ff.); see also IRENA (undated).
156 See Hartmann (2014).
157 RERA (2014).
158 NSA (2011:75f.).
159 See Nampower (2014:18).
160 ECB (2014).
161 (ibid.).

REFIT pricing should be revisited, as free market bidding would yield lower prices. It remains to be seen which support model for renewable energies Namibia will choose. According to NamPower, the Ministry of Mines and Energy has now implemented the Renewable Energy Procurement Mechanism that requires tendering for all renewable energy projects larger than 5 MW in size.[162]

10.3 Legal and Regulatory Framework Relevant to Renewable Energies

Namibia's Vision 2030, launched in 2004 and aiming to provide long-term policy scenarios on the future course of development in the country at different points in time until 2030, sets out the objective to achieve security of energy supply through an appropriate diversity of economically competitive and reliable sources, to ensure that households and communities have access to affordable and appropriate energy supplies; and to establish an efficient energy sector that makes contributions to Namibia's economic competitiveness. Vision 2030 defines as one of its strategies the promotion of renewable energy sources and the implementation of projects for production from these sources to meet industry demand.[163]

The sequential National Development Plans (NDPs) as vehicles for achieving the long-term objectives have addressed the issue of energy security throughout. The fourth National Development Plan (NDP4) for the period 2012/2013 – 2016/2017 with regard to energy infrastructure and liquid fuels sets out in one desired outcome that

> by 2017, Namibia will have in place adequate base load energy to support industry development through construction of energy infrastructure and the production capacity would have expanded from 400 to more than 750 mega watts to meet demand.[164]

Challenges in energy infrastructure and liquid fuels identified in NDP4 include the deficit of 140 MW to cover Namibia's electric power demand; the strong dependence on imports of electricity, particularly from South Africa, which has challenges in providing electricity to its own country; and the fact that, although there are some projects in the pipeline to build new electricity-generation capacity, such projects are time-consuming and do not address the immediate supply constraints.[165]

As one of the strategies to attain the desired outcome, NDP4 plans to

> ensure that the country can deliver its own baseload power supply by investing in infrastructure that produces a desired energy mix, thereby addressing demand and ensuring that key industries have sufficient supply, while taking into account our objective to maintain a clean environment.[166]

162 See webpage of NamPower http://www.nampower.com.na/Page.aspx?p=245, last accessed 4 February 2015.
163 See GRN (2004:87).
164 GRN (2012:xvi).
165 (ibid.:75).
166 (ibid.:78f.).

NamPower has been assigned the role of the responsible agent for securing baseload energy.

One fundamental document with regard to energy policy in the country is Namibia's White Paper on Energy Policy[167] developed by the Energy Policy Committee of the Ministry of Mines and Energy and approved by parliament in 1998. The policy provides a set of comprehensive, integrated measures to guide the sustainable development of the energy sector of Namibia and focuses on energy demand, energy supply and cross-cutting issues. Six strategic goals are laid down in the policy: namely 1. Effective governance to provide stable policy, and legislative and regulatory frameworks for the energy sector; 2. Security of energy supply, achieved through an appropriate diversity of economically competitive and reliable sources, with emphasis on the development of Namibian resources; 3. Social upliftment, meaning that households and communities will have access to appropriate, affordable energy supplies; 4. Investment and growth, with an energy sector that will expand through local and foreign fixed investment, resulting in economic benefits for the country, with particular attention to be given to black economic empowerment; 5. Economic competitiveness and efficiency, with an economically efficient energy sector contributing to Namibia's economic competitiveness; and 6. Sustainability in terms of an energy sector that will move towards the sustainable use of natural resources for energy production and consumption.

Government has, among others, committed itself to investigate options for improving sector efficiency through electricity supply industry restructuring; to introduce an institutional system, with both regulatory and policy-making functions to monitor and regulate electricity price developments; to develop electricity tariff structures and prices based on sound economic principles, generally and as a whole reflecting the long-run marginal cost of electricity supply; to implement a modern and appropriate legal and regulatory framework for the electricity sector through the Electricity Act and associated regulations, and the creation and resourcing of a competent Electricity Board to regulate the sector's operations; and to ensure that adequate protection of electricity end-users and licensees is established through the creation and resourcing of the Electricity Board to be established under the Electricity Act.

The policy puts a strong emphasis on the role of renewable energies. The policy states that:

> [d]evelopment of hydro, gas, solar and wind energy resources would contribute towards sustaining future electricity demands. Increased use of environmentally favourable renewable resources, combined with gas developments, would also contribute towards increased environmental sustainability.[168]

In the policy, government has committed itself to promoting the use of renewable sources of energy wherever this is technically feasible and economically viable.[169]

167 GRN (1998).
168 (ibid.:21).
169 (ibid.:43).

In 2006, The 1998 White Paper was complemented by a Strategic Action Plan for the implementation of renewable energy policies as outlined in the Namibian White Paper on Energy Policy.[170] The Strategic Action Plan identifies nine development objectives, each supported by a strategic aim and recommendations for activities. The development objectives are: 1. Enhanced capacity of the renewable energy and energy efficiency sector; 2. Improved renewable energy and energy efficiency knowledge base; 3. Broadened awareness of renewable energy and energy efficiency; 4. Equal playing field for renewable energy; 5. Improved financing mechanisms for renewable energy technologies; 6. Improved security of energy supply; 7. Enhanced institutional coordination and integration; 8. Improved access to energy; 9. Sustainable development.

Further regulatory or guiding instruments pertinent to the energy sector exist. In 2000, the Rural Electricity Distribution Master Plan was launched as guiding document for the rural electrification through grid extension. The plan gives time-bound targets on how electrification is to be rolled out. This plan was updated in 2005 with the Regional Electricity Distribution Master Plan (REDMP) which defines areas for grid electrification, as well as classifying areas outside these areas as off-grid (grid extension not expected within 20 years), pre-grid (grid extension not expected within 5 to 10 years) and grey (unclear areas or timing, such as informal settlements or un-electrified households).

Several Projects have been initiated under the 2005/06 Barrier Removal to Namibian Renewable Energy Programme (NAMREP).[171] NAMREP was founded with the mission to increase affordable access to RE services and accelerate market development for renewable energy technologies by reducing institutional, information, human capacity, financial, technical, awareness and other market barriers. Projects under NAMREP included, among others, the 2006 Regulatory Framework for Renewable Energy and Energy Efficiency for the Electricity Sector[172] and the 2007 Off-grid Energisation Master Plan (OGEMP).[173] While the former intends to support environmentally sustainable technologies and to attain greater energy security through a steady increase of electricity production in Namibia using fuels and energy sources that are locally available (e.g. sun, biomass, and wind), the latter aims at supporting the roll-out of renewable energy systems and rural electrification. It assessed technologies appropriate for off-grid and mini-grid generation according to the following three factors: fuel and technologies which are already available in Namibia; fuels and technologies which address basic energy needs of households; and technologies that require minimal operation and maintenance costs.

In 2010, The World Bank Group (WBG) and the Electricity Control Board (ECB)

170 See GRN (2006).

171 See GRN (2005).

172 See http://www.mme.gov.na/pdf/undp-reports/reee-regulatory-framework.pdf, last accessed 5 February 2015.

173 Available at http://www.mme.gov.na/pdf/undp-reports/off-grid-masterplan.pdf, last accessed 5 January 2015.

of Namibia have retained a consultant to assist in developing a National Integrated Resource Plan (NIRP) for Namibia, focusing on electricity.[174] The 20-year electricity sector development plan aims to provide an indication of Namibia's electricity demand, how this demand can be supplied and the cost of supply.[175]

On the legislative side, so far the most relevant statutory law in terms of renewable energies in Namibia is the Electricity Act No. 4 of 2007,[176] which provides for private sector participation and under which an independent power producer (IPP) framework has been developed. The predecessor of this Act was the Electricity Act No. 2 of 2000, which established the Electricity Control Board (ECB) and a single-buyer market, with NamPower being the single buyer. Under the 2000 Electricity Act, Regional Electricity Distributors (REDs) have been set up to take over the distribution function from local authorities. A revised Electricity Bill now seeks to allow large off-takers and distributors to participate directly in the wholesale market and thus to modify the single-buyer model. The 2007 Electricity Act describes the requirements, conditions and obligations for obtaining licences to generate, trade in, transmit, distribute, import and export electricity. Apart from a provision which assigns the Minister the competency to make regulations on the "installment and implementation of renewable energy technologies, the use thereof (including the placing of obligations on persons with regard thereto) and the provision of electricity therefrom",[177] the Act does not explicitly thematise renewable energies. So far, no regulation related to renewable energies has been issued under the aforementioned provision.

As environmental framework legislation, the Environmental Management Act No. 7 of 2007 should be mentioned, which came into force on 6 February 2012. Section 27 provides that the Minister of Environment and Tourism may list certain activities that may not be undertaken without an environmental clearance certificate. This list was published on 6 February 2012 and includes activities in respect of energy generation, transmission and storage, and mining and quarrying activities.

With a number of legal documents in the pipeline, it is expected that there will be significant developments regarding the legislative framework in the energy sector in the medium term. A Namibia Energy Regulatory Authority Bill[178] has, for instance, been drafted to regulate electricity; downstream gas including gas pipelines and storage facilities; downstream petroleum pipelines and storage facilities; renewable energy; energy efficiency; and energy conservation. Moreover, a single national energy regulator, the Namibia Energy Regulatory Authority, is established under the bill. According to this bill, the aforementioned Authority must, through energy sector specific legislation,

174 Hatch (2011).

175 See terms of reference for NIRP, available at http://www.ecb.org.na/pdf/nirp/NIRP%20TERMS%20OF%20REFERENCE.pdf, last accessed 4 February 2015.

176 Available at http://www.mme.gov.na/pdf/electricity-act-2007.pdf, last accessed 5 February 2015.

177 Section 43(1)(j) of the Act.

178 Available at http://www.ecb.org.na/pdf/Draft_Namibian_Energy_Regulatory_Authority_Bill.pdf, last accessed 5 February 2015.

regulate renewable energy, energy efficiency, and energy conservation.

In summary, it can be stated that Namibia's regulatory framework in favour of promoting the use of renewable energies and energy efficient technologies is not concerted throughout but wide-ranging. The multitude of relevant instruments developed since the White Paper on Energy Policy was tabled in 1998 shows government's generally positive attitude and goodwill towards the development of a more sustainable energy future for Namibia with more emphasis on renewable energies. It, however, also shows the strong engagement of international and foreign national institutions, which almost always have provided not only financial, but also technical support for the various projects and efforts in renewable energy policy. What seems to fall by the wayside is the implementation of the achievements in energy policy as documented on paper. The lack on implementation can be seen from the fact that, although Namibia issued the White Paper – a sophisticated document with foresight and an approach to innovation as early as 1998, Namibia is nevertheless confronted with a looming energy crisis, as it is still strongly dependent on energy imports from its neighbours, particularly from South Africa. The slow pace of electrification in the rural areas is another indication of a lack of implementation. What seems to be vital at this stage are legal incentives for private producers to provide for and implement support mechanisms for renewable energies – by way of legislation on feed-in tariffs, tendering procedures, power purchase agreements, quota systems, green certificates or net metering. The sooner this happens, the sooner necessary investments will be attracted to unlock Namibia's vast potential of renewable energies – which will ultimately be beneficial for both sustainable development and economic growth.

11 Summarising Remarks

Energy security is one of the most important topics of our times, as energy is an essential requirement for all fields of our daily life, for the functioning of social and political systems, businesses, and communication, and for economic growth and sustainable development. One of the biggest challenges of our time is to reduce climate change, and in light of the fact that *energy-related* carbon dioxide emissions make up most of the harmful global greenhouse gases (GHG) we produce, the world community is necessarily charged with the task of balancing the extension of energy supply, on one hand, and the consumption of energy, on the other. Legal aspects and processes governing the production of secure, clean and efficient energy is an increasingly consuming pursuit of national and international lawmakers and policymakers; and in international and national politics energy security has become the dominant topic at the nexus of national, economic and environmental security.

In many cases of policy making, climate change is addressed in the context of other national objectives – particularly energy security – which shows that these issues are indivisibly interwoven. Energy security and climate change share the need for innovation and technology, smart policy making, high levels of government attention, effective diplomacy and international cooperation.

Global energy governance is intertwined with various facets, including climate change, development, environmental protection, trade, investment, and human security. This explains why the global energy governance regime is fragmented, with its many components being managed in a disjointed manner, bringing about overlaps as well as normative gaps. Numerous instances of interstate cooperation interrelate and create a normative patchwork with implications for the global energy economy and security. This can be attributed to the pursuit of national interests, the diversity of energy sources and the plurality of relevant institutions and agreements. Global energy transition will continue to be high on the international agenda in future, not only in terms of a new UN climate agreement, but also regarding a post-2015 agenda.

Renewable energies play an important role in the field of energy security, and although the deployment of renewable energy technologies does face market challenges, primarily owing to the maturity of the conventional energy markets and technical and financial constraints in the development of renewable energy technology, the need for promotion of renewable energies is becoming more evident than ever before. Worldwide, energy investments are rising and there is a critical need, particularly for developing countries, to encourage private sector involvement by creating investment security.

Legal transfer is an applicable concept to provide support to countries which are still in the process of developing energy-related legislation. National legal systems can draw inspiration from statutes, regulations and other provisions from foreign judicial systems with more experiences in the field of energy law and policy, and can transfer these into own national contexts. While orienting itself with components of a foreign legal system, a country's own legal system can be developed further.

Support mechanisms for renewable energies have been introduced in many countries worldwide, with different types of promotion models. The success of these models varies and is crucially determined by the specific political commitment. Two main support models for renewable energies have emerged, namely feed-in tariff schemes and capacity-driven models.

Germany, with its *Energiewende* and its world-renowned development of technologies for using renewable resources in energy production, has over many years developed a sophisticated regulatory framework based on feed-in tariffs, and was considered to be a pioneer in terms of climate protection. This admiration, however, seems to be fading, as GHG emissions in Germany are increasing instead of decreasing and concerns about rising prices, the loss of jobs in the lignite industry, and the security of energy supply are casting some clouds over the ambitious aims of energy transition in Germany. Despite major achievements, there are some challenges that need to be addressed: first and foremost being a revision of the Emission Trading Scheme; the storage of electricity produced from renewables; and the integration of the electricity generated by decentralised renewable energy power plants into the existing electricity grid structure.

So far, the legal and policy framework for renewable energies in South Africa is varied and patchy. While work on a number of recent legislative, regulatory and planning process developments has picked up speed, progress in renewable energy implementation and follow-up strategies is slow. This is ultimately resulting in a low level of urgently required investments – which in turn hampers the achievement of objectives as set out in the various policy instruments. South Africa is in the midst of a severe energy crisis affecting the South African economy and thus the people. The national utility Eskom has repeatedly implemented load shedding, i.e. the interruption of the power supply to certain areas owing to a lack of electricity to meet the demand. One of the steps that has to be taken to end the electricity crisis soon is to place a stronger emphasis on the promotion of renewable energy sources.

After a phase in which the application of feed-in tariffs seemed to be the procurement mechanism for renewable energies chosen by government, the newly designed Independent Power Producer Procurement Programme (REIPPP), based on competitive bidding processes, is now being implemented. Various reports restore hope for a better promotion of renewable energies in South Africa.

Similar to South Africa's case, there are some concerns about the future energy situation in Namibia, owing to the country's dependence on energy imports from South Africa, on the one hand, and the one-sidedness of Namibia's locally produced powermix, on the other, with the Ruacana hydroelectric power plant (which contributes 99% of all locally generated electricity) being prone to technical failures and being critically dependant on the availability of water in the Kunene River. Namibia's potential for the production of energy from renewable sources is outstandingly high. Although there are some promising projects in the pipeline to cover the increasing energy demand, many of these projects will not be fully operational by the end of this decade, so that the power supply until then remains precarious.

Namibia's regulatory framework in favour of promoting the use of renewable energies and energy efficient technologies is wide-ranging. The multitude of relevant instruments developed since the White Paper on Energy Policy was tabled in 1998 shows government's focus on the development of a more sustainable energy future for Namibia, with more emphasis on renewable energies. It, however, also shows the strong engagement of international and foreign national institutions, which almost always have provided not only financial, but also technical support for the various projects and efforts in renewable energy policy. What seems to fall by the wayside is the implementation of law and policy. It is vital at this stage to put in place legal incentives for private producers, and to provide for and implement support mechanisms for renewable energies by way of legislation on feed-in tariffs (a draft of *Renewable Energy Feed-in Tariffs* is currently subject to discussion), tendering procedures, power purchase agreements, quota systems, green certificates or net metering, or a combination of these. The sooner this happens, the sooner investment will be attracted to unlock Namibia's vast potential of renewable energies – which will ultimately be beneficial for both sustainable development and economic growth.

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8.
LEGAL AND POLICY FRAMEWORKS FOR CLIMATE-FRIENDLY ENERGY GENERATION IN AFRICA: ENERGY SECURITY FOR FUTURE DEVELOPMENT

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1 Energy and Climate Change: Current Status in Africa

As affirmed in its 2014 report, the Intergovernmental Panel on Climate Change (IPCC), under the United Nations Framework Convention on Climate Change (UNFCCC), the effects of climate change, which are already being experienced on all continents, are likely to increase substantially unless greenhouse gas emissions are brought under control.[2] The heavy reliance on fossil fuels such as petroleum, coal and natural gas for energy is now recognised as one of the primary causes of anthropogenic climate change, given the amount of resulting carbon dioxide and greenhouse gas emissions.[3]

Consequently, climate change mitigation efforts have rightly been focused on the energy sector, in a bid to shift towards more climate-friendly sources of renewable energy including bioenergy, hydro-powered energy, and geothermal, wind and solar energy.

While the gap between demand and supply of energy has over the last few decades been narrowing in most developing countries, the gap has continued to widen in Africa, raising concerns over energy security prospects in view of future development.[4] Africa continues to grapple with critical challenges which are undermining its capacity to meet its energy demands to power its economic development. As at 2013, Africa is now home to half of the world's population without electricity.[5]

Most African countries continue to rely on non-renewable forms of energy, particularly

1 The author would like to acknowledge the assistance received from her research assistant Cynthia Liavule.
2 IPCC (2014:852 and 858).
3 Fischer Kuh & Gerrard (2012:143).
4 UNIDO (2009:1).
5 REN21 (2014:93).

coal, gas, petroleum and crude oil. Traditional biomass is the major source of energy in Africa, accounting for approximately 70–90% of the energy supply in most countries, despite the environmental, social and health problems associated with it.[6] In the Democratic Republic of Congo and Tanzania, for instance, 94% of the population continue to rely on traditional biomass for cooking, with Kenya at 83% and Nigeria at 75% of the population.[7]

1.1 Potential for Renewable Energy in Africa with a Focus on Solar Energy

Renewable energy technologies rely on natural resources that can be replenished, and thus include bio-energy, geothermal energy, hydropower, wind energy and solar energy. Africa is not lacking in renewable energy sources. It is estimated that the continent has a potential to generate 1 800 TWh per year from hydro power, which is about 12% of the world's hydropower potential.[8] East Africa alone has a potential geothermal capacity of 15 000 MW, while sub-Saharan Africa has an additional power generation capacity of 170 GW, which is more than double its current supply.

Solar energy is among the fastest growing renewable energy sectors globally. The global solar photovoltaic (PV) market in 2013 made a new record, installing more capacity than other renewable technology, second only to hydropower technology.[9] Furthermore, in the same year, solar technology received the greatest share of global investment in renewable energy for the fourth year running. The increasing investment demonstrates the appreciation of the potential of solar energy to supplement the energy mix.

Africa and more specifically sub-Saharan Africa is home to the highest solar radiations in the world, with the potential estimated at about 6 kWh per square metre per day. This constitutes a potential source of energy not just for Africa, but for the rest of the world. This has been confirmed by satellite-based studies conducted by the German Aerospace Centre, which affirms that less than 0,3% of the total desert areas of the Middle East and North Africa (MENA) region have the potential to house solar thermal power plants to generate the energy needed to meet present and future demands of the region and of the EU. Renewable energy thus has the potential to help Africa accelerate the transition from traditional energy sources to modern climate-friendly energy, particularly in rural areas which in most of Africa continue to be underserviced.

Given this potential of renewable energy in improving energy security while mitigating greenhouse gas emissions, governments in Africa are adopting renewable energy technologies to foster national development. Investment in renewable energy in Africa and the Middle East has been growing steadily from US$0,5 billion in 2004 to US$10,4

6 UNIDO (2009:8).
7 REN21 (2014a:138).
8 Appleyard (2014).
9 REN21 (2014a:47).

billion in 2012 with a slight drop to US$9 billion occurring in 2013.[10] Among the leaders on the African continent in terms of investment in renewable energy is South Africa, which recorded an investment of US$4,9 billion. In 2013, Kenya became the second largest investor in Africa at US$249 million, followed by Mauritius and Burkina Faso.[11]

Despite the growing investments by African countries, the most significant investors in solar energy globally are largely from other continents such as Asia, which in 2013 surpassed Europe after its decade-long leadership of the solar energy market. The performance of Asia in the solar energy sphere is attributable to the huge investments in China and Japan, which together with the United States were the three top installers in 2013. China alone accounted for almost a third of the global installations, managing to triple its capacity to approximately 20 GW.[12]

Most investments in solar energy technology in Africa have taken the form of small-scale energy systems mainly solar PV systems and the solar thermal energy systems for heating, drying and cooking. Solar home units are the most common application of the systems, with South Africa and Kenya boasting the highest number of documented installed capacities of solar PV systems. Egypt, Mozambique, Tunisia, Zimbabwe and South Africa have all invested in solar thermal systems for water heating. However, the markets in African countries face challenges of lack of standards, resulting in poor quality products and installations. Few countries in Africa have large-scale solar energy plants. South Africa is the only country among the global leaders in the solar energy market. In 2013, the largest solar energy facility in Africa, which is in the country, came on line.[13]

1.2 The Challenges in Unlocking Africa's Potential

While the level of investment in renewable energy is increasing, the gains made are still marginal and Africa is still a long way off providing clean energy to all. To unlock its renewable energy potential, Africa has to contend with some of the challenges undermining the growth of the sector.

1.2.1 Costs and Pricing

A key primary challenge in adopting renewable energy and especially solar energy is the high initial investment outlay these technologies require. Undoubtedly, in the long run, lower fuel and operating costs often result in renewable energy being cost competitive. However, higher initial costs may make it impossible to install the renewable energy and this thus leaves its potential unlocked. This is because renewable energy technologies often require heavy financing to generate comparable capacity to other conventional

10 (ibid.:68).
11 (ibid.:70).
12 (ibid.:47).
13 (ibid.:48).

forms of energy generation. The high costs coupled with the low purchasing power have hindered the growth of the renewable energy market.

Apart from the heavy initial costs, subsidies on fossil fuels have resulted in an un-level fiscal playing field that has rendered renewable energy less competitive. A recent report of the International Monetary Fund estimated that in 2011 post-tax subsidies on fossil fuels globally amount to approximately US$1,9 trillion a year, which constitutes 2,5% of the global GDP.[14] Most of these subsidies are granted by the developing world on the justification of reducing poverty levels. About US$480 billion was spent globally on direct subsidies granted by governments for the price of petroleum, natural gas, coal and electricity in the same year.[15] Apart from these direct subsidies, fossil fuels enjoy indirect subsidies due to the failure of governments and markets to take into account the associated external costs in their pricing. Such costs include the cost of environmental pollution caused by greenhouse gas emissions. The failure in pricing of fossil fuels has placed renewable energy at a competitive disadvantage.

1.2.2 Lack of Financing

As noted, earlier, the total global investment in the renewable energy sector has been growing since 2004. However, Africa's share in this investment is marginal. In 2012, of the US$268,7 billion invested globally in renewable energy, only about US$4,3 billion was invested in Africa.[16] For the same period, only 1,5% of the total solar trade came to Africa and even then most of this was directed primarily to South Africa. In 2013, only South Africa and Kenya were included in the top tier for their investment in renewable energy in general and geothermal energy, respectively.[17]

Foreign financing has provided a reprieve to the renewable energy sector. However, this form of financing has not been without its challenges. Donor investments in renewable energy from agencies such as Global Environment Facility have focused efforts on the rural poor. This has led to the perception in Africa that renewable energy, such as solar energy technologies, is for the rural poor who are often not supplied by the centralised grids servicing urban centres. This perception, it is argued, has led to a lack of interest by middle class investors in solar energy, thus undermining any potential for local investment in renewables.[18]

1.2.3 Market Barriers to Renewable Energies

Most renewable energy projects and initiatives in Africa have tended to focus on the rural areas where demand for energy is high and the supply very low. Consumers or

14 IMF (2013:13).
15 (ibid.:9).
16 Hankins (2013).
17 REN21 (2014a:16).
18 Hankins (2013).

investors in this area often lack access to the credit necessary to invest in renewable energy. The lack of certainty with respect to the market for renewable energy renders these investments risky, thus reducing the capacity of renewable energy investors to access long-term credit facilities.

Further, in many African countries, power utilities enjoy a monopoly on electricity production and distribution. The absence of a supportive legal framework renders it impossible for new entrants into the renewable energy field to sell power either to the utility or independently to third parties. Moreover, even where such utilities are willing to negotiate power purchase agreements, they use their status as a monopoly to enter into one-sided and often commercially non-viable agreements.

1.2.4 Lack of Supportive Policy and Legal Frameworks

The above-mentioned challenges facing the renewable energy sector are ultimately problems of a lack of a supportive policy and legal framework that would include the institutional and economic instruments necessary to drive the sector.

These challenges are not peculiar to Africa, but rather explain the slow uptake of renewable energy technologies worldwide. It is only in the last two decades that the global market for clean energy has transformed to vibrancy. Arguably, the turn-around in countries with a booming renewable energy sector has been the development of supportive legal and policy frameworks. The shift to renewable energy can only occur where there is a supporting policy and a legal regulatory environment that foster information and technical capacity, and financial incentives to boost the renewable energy sector.

The next section seeks to identify how policy and legal frameworks have been used to transform the renewable energy sector. A critical analysis of the extent to which the policy and legal regulatory frameworks of African countries provide the necessary support to grow the renewable energy sector is also conducted.

2 Policy and Legal Frameworks for Climate-friendly Energy Generation

International law often sets the trend for development of national laws, as is evidenced in the realm of international human rights law. However, in the case of international environmental law and more specifically in the case of climate change law, this has not been the trend. The challenges in achieving global consensus on specific and ambitious targets for the reduction of greenhouse gases have resulted in regional policy and legal frameworks, constituting a better basis for development of national frameworks. The European Union has demonstrated this in so far as environmental law and even climate change policy and legal frameworks are concerned.[19]

19 Oberthür & Kelly (2008:38–39).

An overview of the international legal and policy framework for renewable energy follows.

2.1 International Legal Framework for Renewable Energy

As is the case with most international environmental law instruments, the international framework for renewable energy is composed largely of normative provisions that are contained in non-legally binding instruments. The 'soft law' instruments relating explicitly to renewable energy are few and thus often recourse must be had to general principles, rules and norms in environmental and sustainable development international laws to support renewable energy. There is for instance, no multi-lateral treaty dealing with renewable energy, but rather rules, principles and policies that have been adopted both by states and non-state actors in relation to renewable energy. The regulatory effectiveness of such soft law instruments has been questioned in the wider context of international environmental law, though in the absence of binding instruments these instruments serve as guidelines for regional and national policy and regulatory frameworks, and to this extent a brief overview of the same is undertaken in this section.

The dearth of explicit references to renewable energy in international instruments does not indicate the lack of an appreciation of the importance of renewable energy and its crucial role in the pursuit of sustainable development. The Report of the World Commission on Environment and Development (the Brundtland Report) dedicated an entire chapter to the subject of energy, in recognition of the fundamental relation between future development and energy security. Energy security in turn can only be guaranteed if energy sources are 'dependable', safe and environmentally sound'.[20] The report's reference to the nexus between energy, economy and development demonstrates the crucial nature of energy in the balance of interests for achieving sustainable development. While recognising the 'untapped potential' of renewable energy in achieving energy security, the report points to the need for national legal and policy frameworks to remove or reduce the economic and institutional constraints holding back renewable energy, for example the hidden subsidies for energy sources that are not climate-friendly.

Agenda 21 makes a modest attempt at providing an international policy directive in relation to renewable energy.[21] It points out that the constraints hindering the development of environmentally sound energy supplies should be removed so as to achieve sustainable development, and proposes certain activities for achieving this.[22]

Through the Johannesburg Plan of Implementation, over 118 countries demonstrated their commitment to implementing renewable energy laws and policies.[23] Arguably, the Johannesburg Plan of Implementation is the most extensive soft law instrument on renewable energy, given its clear provisions in support of renewable energy

20 UN (1987).
21 UN (1993:9.12(a), 9.12(d), 9.12).
22 (ibid.:9.9 and 9.11).
23 UN (2002:9(a), 9(g), 38(f)).

development, implementation, technology issues and commercialisation.[24] Further, the plan is lauded for its delinking of economic growth from environmental degradation, which assumption it is argued in this article is the root cause of the lack of political will in embracing climate-friendly energy sources in Africa.

The Plan of Implementation of the World Summit on Sustainable Development (WSSD) (paragraph 20(e)) made various policy recommendations for governments in relation to diversification of energy and specifically the use of renewable energy. The Beijing Declaration on Renewable Energy, an initiative of 78 governments, constitutes a positive initiative towards the use of renewable energy, though with little legal force.

While no convention on renewable energy exists, certain provisions in some international environmental law conventions make reference to renewable energy. The United Nations Convention on the Law of the Sea (UNCLOS), in recognising the sovereign right of countries to exploit their resources, includes the right to produce energy from renewable sources including wind and oceans.[25]

The United Nations Framework Convention on Climate Change (UNFCCC) arguably constitutes an inexplicit attempt at a multi-lateral treaty promoting renewable energy.[26] Although, it makes no explicit reference to renewable energy, the UNFCCC promotes renewable energy by seeking to reduce the emission of GHGs, particularly from fossil fuel production. In spite of potentially constituting an international legal instrument for renewable energy, the regulatory force of the UNFCCC is limited. The UNFCCC does not contain legally binding obligations on states demonstrating the challenges faced at the global level in achieving consensus in relation to climate change adaptation and mitigation obligations.

The Kyoto Protocol to the United Nations Framework Convention on Climate Change (Kyoto Protocol) represents an attempt to set legally binding targets in relation to the reduction of GHG emissions. Article 2(a)(1)(iv) explicitly makes reference to renewable energy, requiring states to research and promote the use of renewable forms of energy. Indirectly, the attempts to set targets for GHG reductions contribute to the development of renewable energy, as countries seek to find more climate-friendly energy sources. The experience of the first set of targets demonstrates the need for a more comprehensive framework for the reduction of GHGs. The difficulty in achieving a consensus on the fate of the successor of the Kyoto Protocol suggests a grim prospect of using the international legal framework for climate change to drive renewable energy.

24 Bruce (2013).

25 The Convention was opened for signature 10 December 1982 (1833 UNTS 3) and entered into force on 16 November 1994.

26 The United Nations Framework Convention on Climate Change was opened for signature on 9 May 1992 (1771 UNTS 107) and entered into force 21 March 1994, Articles 2 and 4 UNFCCC.

The United Nations General Assembly (UNGA) declared 2012 the Year of International Sustainable Energy for All.[27] The United Nations Secretary General, in an attempt to get countries to set clear policy goals in relation to renewable energy, recommended the adoption of a global energy strategy. The bottom-up approach of this proposal seems to constitute a concession that a global commitment on sustainable energy is unlikely and that it may be more effective to begin at regional or national levels and eventually achieve overarching international goals.

2.2 Regional Legal Frameworks for Renewable Energy in Africa

Early energy policies relating to renewable energy in Africa were driven by challenges in energy security rather than environmental considerations. The oil crises of the early and late 1970s led to the establishment of departments and ministries of energy in many African countries in the bid to establish and promote sound energy policies. In recent years, the growth in the renewable energy sector and investment opportunities has led to the adoption by many countries of some form of renewable energy policy. By 2014, at least 35 African nations had adopted a renewable energy policy with about 37 countries having one or more renewable target.28

Policy development and coordination at the regional level in Africa is the task of the African Union (AU) and the New Partnership for Africa's Development (NEPAD). These have formulated the AU/NEPAD African Action Plan, and, with the African Development Bank, the Programme for Infrastructure Development in Africa (PIDA) Priority Action Plan in a bid to grow the energy sector. Further, the various regional blocs in Africa, such as the East African Community of West African States (ECOWAS), the Southern African Development Community (SADC) and the East African Community (EAC), have also developed regional energy action plans, which include plans on growing the renewable energy sector.

2.2.1 The Economic Community of West African States (ECOWAS)

The various regional economic blocs in Africa have also recently addressed renewable energy issues more keenly. In the west, the Economic Community of West African States (ECOWAS) in 2010 established the ECOWAS Centre for Renewable Energy and Energy Efficiency (ECREEE). The ECREEE in 2012 issued two landmark policies, the Renewable Energy Policy (EREP) and the ECOWAS Energy Efficiency Policy (2013) both of which were adopted by member states in 2013. The regional policies are commendable in so far as they seek to set clear long- and short-term targets in relation to renewable energy. The EREP, for instance, provides for both off-grid and grid-connected renewable energy targets from the various sources with a 2020 and 2030 timeline.29 ECREE is playing an important role in facilitating the creation of legal and policy frameworks for the ECOWAS member states. The success of ECREE in West

27 UN (2011).

28 REN21 (2014b:54).

29 See ECREEE (2012:61ff.).

Africa has led to the development of similar initiatives in the southern and east African economic blocs.

2.2.2 The Southern African Development Community (SADC)

In the south, the Southern African Development Community (SADC) has a common Protocol on Energy which serves as a framework for energy cooperation among member states. SADC has several strategic plans dealing with energy development in the region, including the SADC Energy Cooperation Policy and Strategy, the SADC Energy Action Plan, the SADC Energy Activity Plan, the Regional Infrastructure Development Master Plan, and the Energy Sector Plan. Although not dealing solely with renewable energy, these energy plans make reference to renewable energy. The ongoing process of creation of the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE) is expected to boost development and implementation of renewable energy policies in the region and in member states.

2.2.3 The East African Community (EAC)

As is the case with SADC, plans are underway to create the East African Centre for Renewable Energy and Energy Efficiency (EACREEE) in a bid to fast track the development of legal and policy frameworks for renewable energy in the East African Community Region. Currently, the region has several strategic plans on energy, but none dealing solely with renewable energy. The Regional Strategy on Scaling-up Access to Modern Energy Services, whose implementation is handled by the Renewable Energy Working Group, is an institution created to facilitate the implementation of modern energy generation.

2.2.4 The Common Market for Eastern and Southern Africa (COMESA)

The Common Market for Eastern and Southern Africa (COMESA) has initiated projects in the area of renewable energy. A baseline renewable energy database was developed as a means of fostering investment in sustainable renewable energy projects. The project also sought to improve commercialisation of renewable energy technologies by identifying and eliminating barriers to the sector.

Efforts are underway for EAC, COMESA and SADC to develop a tripartite renewable energy baseline database. The initiative is driven by the appreciation of the need to establish comprehensive baseline information on renewable energy value chains so as to identify opportunities for value addition, building capacity and highlighting the required policy and regulatory reforms to improve competitiveness of the identified value chains.[30]

30 See Terms of Reference for the Value Chain studies on the Renewable Energy and Bio-fuels Industry in EAC Region Project, available at procurement.trademarkea.com/terms_of_

Most of the Regional Economic Community (REC) policies on renewable energy have been developed in the last five or so years and it is still too early to evaluate their effectiveness in driving the growth of renewable energy in the region. Nevertheless, as noted in the case of ECOWAS, initiatives on renewable energy at the regional level have contributed to the development of national legal and policy frameworks for renewable energy.

The policy focus at the level of RECs has been on transnational infrastructure development for energy access. Multilateral and bilateral initiatives have, in some cases, influenced the development of national energy plans and this has led to the inclusion of renewable energy goals and initiatives. The Africa-EU Energy Partnership (AEEP) with its 2020 targets on energy access, energy security, renewable energy, and energy efficiency is an example of such initiatives.

The developments in the international legal framework have, to some extent, helped to drive regional policy direction in relation to renewable energy in Africa. Nonetheless, owing to the emphasis on the principle of common but differentiated responsibility in the context of the climate change framework, the obligation to reduce GHGs and thus turn to renewable energy sources in Africa has not been a major driver. Most regional renewable energy policies seem to be driven by the requirement of development partners that regions be included in energy plans, rather than by the conviction in the region of the need to shift to climate-friendly energy for sustainable future development.

2.3 National Policy and Legal Frameworks Driving Renewable Energy

The development of energy policies is premised on the assumption that a coherent, consistent and conducive legal and policy framework is central to the successful implementation of renewable energy. Renewable energy frameworks comprise national renewable energy and energy efficiency policies. Such policies ought to set clear mid- term and long-term targets. A regulatory framework in the form of an overarching law on renewable energy or provisions in other laws, regulations and standards is also an important component of a renewable energy legal framework. The implementation of the policies and laws are assured through the use of market or fiscal incentives and other economic instruments, such as tax exemptions, feed-in tariffs, investment subsidies, etc. An analysis of the components of a renewable energy legal and policy framework in the context of African nations demonstrates the status of the region.

reference/displayRecord?id=134&PHPSESSID=f6c5cd0937f6587ebd08fd9a85e25d66, last accessed 23 February 2015.

2.3.1 National Policy Frameworks for Renewable Energy

At the national level, renewable energy support policies are geared towards a multiplicity of objectives, including reducing the barriers to the deployment of renewable energy; providing a level playing field in the energy sector; catalysing the renewable energy industry development, building sustainable renewable energy markets and making renewable energy cost competitive. Further, such policies could help meet energy security demands, while mitigating climate change.

Most African countries have energy policies whose primary focus is to advance energy access. The reason for the focus is historical, as most early policies were driven by a response to the oil crises of the early and late 1970s. The period was marked by the establishment of departments and ministries of energy to promote sound energy policies. Reference was made to renewable energy technologies as an alternative source of energy, but this was an ancillary to their primary goal of addressing the issue of energy access. A further flurry of activity in terms of development of national energy policies occurred in the late 1990s and early 2000s in response to the high oil prices characterising the period.[31]

A review of the status of African countries with a clear policy on renewable energy demonstrates a picture analogous to a patchwork quilt. As at 2014, more than 80% of the ECOWAS member states all had policy documents in place that include clear provisions seeking to advance energy access. However, only Gambia and Nigeria had explicit renewable energy policy documents. A review of the countries in sub-Saharan Africa confirms that, as is the case with ECOWAS, most have energy policy documents albeit at varying levels of development, revision and implementation.[32] In some countries, the energy policies form part of an integrated set of development policies, as is the case in Rwanda. However, countries such as Ethiopia, Ghana and South Africa have more integrated energy policies.

Renewable energy in most African countries is provided for in the context of the wider energy plans and often in relation to rural electrification projects. Most of the rural electrification projects of ECOWAS member states, for instance, do not focus on renewable technologies per se, but rather the technologies are referred to in so far as they provide a means for improving energy access.[33]

The development of national energy policies in Africa seems to be reactionary as opposed to being the result of the conviction by African governments of the need for an energy policy framework, one of whose goals is to drive renewable energy. Most governments have sought to develop energy policies in order to access global financing, which often is pegged to the existence of a national policy on energy which includes renewable energy. For instance, at the regional level, energy policy development and coordination has been driven by the African Union working in collaboration with the

31 Karekezi (2003).
32 IEA (2014:73).
33 ECREEE (2012:155).

New Partnership for Africa's Development (NEPAD) and the African Development Bank.[34] In Kenya, the formulation of the National Energy Policy was driven by the government's need to access foreign investment to help improve energy access.[35]

The extent to which these policies are updated and implemented varies across nations. An evaluation of energy policies in the sub-Saharan region has confirmed that the existence of policies is not necessarily an indicator of success. Government and other stakeholder commitment is crucial for the effective implementation of the policy.

Apart from a national policy, an ideal renewable energy policy framework should include clear targets with realistic time frames. These renewable energy targets have served as an important tool for driving the sector at both the regional and national levels.

While most African countries have energy policies, fewer have clear targets relating to renewable energy, and even fewer have capacity-based targets. Only 37 countries on the continent have some form of renewable energy targets. Some of the countries with renewable energy targets include Egypt, Ethiopia, and all ECOWAS member states, except Burkina Faso and Gambia.[36] In sub-Saharan Africa, countries with renewable energy targets include Ethiopia, Ghana, Mozambique, Senegal, Tunisia and South Africa.[37] The existence of renewable energy targets is a step in the right direction, but the mere inclusion of targets is not sufficient. Egypt, for instance, has clearly defined targets on renewable energy, but is yet to develop a comprehensive strategy on how to attain these targets.[38]

2.3.2 Renewable Energy Laws and Regulations

Apart from a clear renewable energy policy with clear targets, a good framework for renewable energy should have supportive and strategic legislation. The law should incorporate strategic elements that facilitate the implementation of policy and targets set. It should also establish the institutional frameworks necessary for implementation and monitoring for compliance.

2.3.3 Renewable Energy Support Instruments

The renewable energy legal and policy framework is implemented through various support instruments which fall within three broad categories: regulatory instruments, fiscal instruments and public finance measures. Different countries in Africa have adopted a mix of these instruments as a means of implementing their policy and laws on renewable energy. An analysis of the instruments and the extent to which they have been adopted in African countries demonstrates that in many cases their use continues to be limited.

34 IEA (2014:73).
35 GRN Kenya (2004).
36 ECREEE (2012).
37 IEA (2014).
38 *GIZ* (2012).

2.3.3.1 Regulatory Instruments

Price-based Feed-in Laws

Price-based feed-in laws comprise laws, regulations or standards requiring centralised electricity distributors to connect independent power producers to their grid and purchase the energy generated at fixed tariff rates and for a pre-determined duration.

These tariffs are set by the relevant energy sector authority and seek to take into account factors such as cost differentials and externalities. These systems have been used in Europe in Germany, Spain and France.

Some form of feed-in tariffs has been implemented by several African countries, including South Africa, Kenya, Uganda, Ghana and Nigeria. Nevertheless, the implementation of the feed-in tariff mechanisms has not been without challenges. South Africa's feed-in tariff mechanism, adopted in early 2009, was marred by controversy from the outset, leading to its abrogation and replacement with a system of public competitive bidding in 2011.[39] The scope of Kenya's feed-in tariffs was originally limited, extending only to electricity generated from wind, biomass and small-scale hydropower. A revision in 2010 led to the extension to geothermal sources and solar electricity generation. The feed-in tariffs in Kenya have arguably not achieved their objective of boosting the market for renewable energy for various reasons. Firstly, the policy provides for maximum tariffs, which means that actual payments can be lower depending on the negotiations between power producers and the power utility, which, as is the case in most African countries, is a monopoly and thus has greater bargaining power. The feed-in tariff was established through a regulation as opposed to a statutory provision and thus there is uncertainty in terms of its security – a factor that deters investors.[40]

Net-metering

Net metering is a mechanism that allows renewable energy providers to gain credits from the electricity they use and subsequently to offset this against the electricity they use from the grid. This is a common incentive used in the solar energy sector, where a residential customer with a rooftop PV system may be allowed to feed into the grid the excess electricity generated to offset the amount of electricity used from the grid and thus to be metered only for their net energy use.

Few African countries have adopted net metering. Among ECOWAS member states, only Cabo Verde has a system of net metering. In 2015, South Africa's National Energy Regulator published a draft proposal of a net-metering system.

39 (ibid.).
40 (ibid.).

Quantity-based Renewable Energy Portfolio Standards

Quantity-based renewable energy portfolio standards require that a minimum share of power or a minimum level of installed capacity is obtained from renewable energy. In some instances, this option has taken the form of tradable quota systems under which electricity suppliers of more than a pre-determined quantity of power are obliged to supply a certain proportion of electricity from renewable sources. Such a scheme thus provides a market for renewable energy producers. Renewable energy portfolios have been used in Australia, Denmark, Italy and the Netherlands, as well as some states in the United States of America. There is at present no African country with developed renewable energy portfolio standards.

Trade Renewable Energy Certificates

Trade renewable energy certificates are certificates of proof of production of a particular quantity of renewable energy and which can be traded. Renewable energy certificates are common in the United States of America. South Africa has a trade renewable energy certificate system through which credits from renewable energy can be traded in an open market.

2.3.3.2 Fiscal Instruments

Fiscal incentives for renewable energy can take a variety of forms, including tax exemptions, deductions, tax credits, preferential tax treatment or a deferral of a tax liability. Some of the incentives used by governments to drive their renewable energy sectors include investment tax exemptions for renewable energy projects. The reduction or exemption from import duty of renewable energy products is another form of fiscal incentive employed to foster renewable energy. Governments have also resorted to reduction of related consumption taxes for renewable energy products. For instance, the reduction of exemption from value added tax (VAT) or energy tax. Few African countries provide a wide array of fiscal incentives for renewable energy technologies. Where these are present they often take the form of capital subsidies, grants or rebates on renewable energy technology or tax exemptions of certain renewable energy products or the reduction in taxes relating to renewable energy products.

2.3.3.3 Public Finance Measures

The shift to renewable energy is a costly exercise with initial outlays being high and the return on these investments often being long term and uncertain. As a consequence, investors in renewable energy often find it difficult to source financing from commercial financiers. African governments have thus sought to increase the commercial viability of renewable energy projects by offering capital subsidies, rebates, low interest loans, and, in some cases, loan guarantees.[41]

41 (ibid.).

The funding for renewable energy technologies has been offered by governments directly through state-owned banks or indirectly through subsidies granted to commercial banks. International development banks such as the Asian Development Bank and the African Development Bank have also provided funding for renewable energy projects. International climate funds are also a possible source for funding. Certain countries such as Tunisia and South Africa provide capital subsidies as a means of fostering renewable energy. Among ECOWAS countries, only Ghana and Nigeria provide some form of capital subsidy, grant or rebate.[42]

Apart from providing capital subsidies, some African nations such as Egypt, Morocco and South Africa have adopted public competitive bidding systems. These systems allow governments to sponsor competitive bidding for the acquisition of renewable energy and the awarding of long-term power purchasing agreement contracts to the lowest bidders.

2.4 Inherent Problems in Renewable Energy Frameworks

A further challenge facing the legal and policy frameworks for renewable energy in African countries is their ad hoc nature. Shifting policies in the renewable energy sector do not provide the security and certainty necessary for investors seeking to commit capital in the renewable energy sector. A case in point is the National Energy Regulator of South Africa's (NERSA) move in 2011 to review tariffs that had been set in March 2009. In 2013 Kenya imposed a 16% value added tax (VAT) on imported solar products, but retracted this in May 2014. Such shifts in policy result in uncertainty in markets for renewable energy and thus hinder investment in the sector.

In addition to the problem of shifting policies, most renewable policy measures in Africa are not backed by clear renewable energy plans.[43] As a result, the initiatives fail to have the intended effect of growing the renewable energy market owing to the absence of a coherent and coordinated approach across sectors. In some countries, the pressure to develop laws and implement economic instruments to support renewable technologies is not driven by a conscious and pre-determined national plan, but rather by the need to demonstrate the existence of the laws and policies in order to access global funds earmarked for renewable energy projects.

Apart from legal and policy measures, robust institutions with technical capacity are required effectively to implement a framework for renewable energy. These include experts, if not in development, at least in testing, operation and maintenance of renewable energy technologies. The absence of strong institutions with the technical capacity to drive the renewable energy sector is a major hindrance to the effectiveness of legal and policy frameworks for renewable energy.

42 UNIDO (2009), ECREEE (2012) and REN21 (2014:60).

43 UNIDO (2009:16).

An analysis of the performance of the electrical power generation utilities of most African countries demonstrates some of the challenges contributing to the inefficient use of energy. Most of the power utilities are centralised corporations whose commercial viability is not a priority, given the urgent need to provide access to the poor who are a majority. The lack of sufficient capital undermines the capacity of these utilities to operate efficiently. Recent reforms in the power sectors of most African countries have resulted in hybrid markets where independent power producers complement the state-owned utilities. The implementation of these hybrid markets poses challenges in policy, regulation, planning and procurement and thus fails to contribute to efficient investment decisions.[44] The challenges facing the energy sector have adversely affected efforts at embracing cleaner forms of energy.

3 Beyond Legal and Policy Frameworks: Africa's Challenge in Growing Renewable Energy

The foregoing section demonstrates that, as of 2014, most African countries had a legal and policy framework for renewable energy which incorporates some form of supportive instruments. Nevertheless, these frameworks are in many cases still at a nascent stage and thus the jury is still out as to how effective they will be in driving the renewable energy sector, while ensuring that the countries meet their energy demands in a bid to achieving sustainable economic development.

The existence of a legal and policy framework for renewable energy does not per se guarantee that a country will have a robust renewable energy sector. Other extenuating factors may explain the reason why, despite the great potential of renewable energy in Africa and the strides made in developing legal and policy frameworks, the sector has yet to thrive.

In Africa, governance challenges relating to corruption, inadequate regulatory and legal frameworks, weak institutions and poor transparency and accountability have been identified as factors hindering the growth not just of the renewable energy sector, but also of the wider energy sector. Context-specific complexities also play a part in undermining laws, rules and regulations designed to foster particular socio-economic outcomes.

3.1 Lack of Political Will and Conviction

The main challenge hindering growth of renewable energy is arguably the lack of political will in embracing clean energy, though this is by no means a problem peculiar to Africa. Globally, the shift to renewable energy and the implementation of initiatives that reduce the GHG emissions caused by fossil fuels has been an uphill task. Even among developing countries, nations have continued to focus efforts on cleaning the conventional energy generation modes as opposed to substituting these for renewable energy.

44 Eberhard et al. (2008).

In Africa, this despondency about implementing change is exacerbated by the fact that even the non-renewable energy resources are to a large extent still underutilised and thus the urgency to reduce GHG emissions has not been perceived as urgent. The need to meet the energy demand required to end poverty and achieve economic development is perceived as a more pressing need. The underutilisation of even the non-renewable energy resources in Africa is the result of a myriad of factors, including lack of access to modern energy services particularly in rural areas, poor infrastructure, low purchasing power and the over-reliance on traditional biomass to meet domestic energy needs.[45]

Further, the experience with renewable energy technologies in Africa has not always been positive, as can be attested by the number of failed renewable energy projects on the continent.[46] These negative experiences have contributed to the apparent lack of conviction of the sustainability of renewable energy projects in the context of meeting Africa's energy demand.

3.2 Energy Security or Climate-friendly Energy: A Sustainable Development Issue

An analysis of national energy policies and the supporting legal frameworks of most African countries demonstrates that these place greater emphasis on energy access and security. Consequently, renewable energy technologies are supported in so far as they can help boost energy supply particularly in rural areas.[47] This approach is in contrast to that in other European countries where environmental considerations and a commitment to reduce GHGs has led to the conviction of the need to substitute conventional fuels with more climate-friendly sources of energy. Germany's Energy Plan (the Energiewende), for instance, was developed in the 1980s as a reaction against the adverse effects of nuclear power, environmental destruction and climate change.[48]

The difference in factors driving legal and policy frameworks for renewable energy in Africa and other developed nations brings to the fore the issue of common but differentiated responsibility, which has characterised the implementation of the climate change framework laws at the global level. In Africa, the main driver for renewable energy is access, with environmental benefits viewed as an ancillary. Underlying this approach is the conviction that Africa's contribution to greenhouse gas emissions is relatively insignificant and thus the onus of bearing a share of the responsibility in mitigating the adverse effects of these emissions should not be borne by the continent. Further, the 'differentiated responsibility' is premised on the recognition that in developing countries the first and overriding priorities are economic and social development and eradication of poverty.[49]

45 UNIDO (2009:8).

46 Brent & Kruger (2008).

47 UNIDO (2008:Module 9).

48 Swedish Agency for Growth Policy Analysis (2014).

49 The United Nations Framework Convention on Climate Change was opened for signature

An inexplicit presumption underlying the common but differentiated principle is the conviction that economic and social development across nations follows a linear trajectory. The concession to developing countries in relation to use of greenhouse gas-emitting fuels suggests that these fuels are viewed as a necessary evil in achieving economic development. Such a view is premised on the assumption that developing nations will, as a rule, follow the same path that developed nations did. The slow uptake of renewable energy in Africa is to a great extent a reflection of the extent to which this linear development presumption is considered valid.

Development theories supporting a common linear trajectory for all nations have been disproved by modern development theories and also by experience. An appreciation of this reality could help result in the paradigm shift necessary to sustain the political will required to bring about the revolution in the energy sector towards climate-friendly energy for energy security and sustainable future development. In the absence of this shift, the balance of the ingredients of sustainable development will continue in the case of Africa to lean more heavily towards social and economic development over environmental sustainability.

The extent to which the World Bank's notion of 'inclusive green growth' will provide an effective framework for shifting this paradigm in Africa is yet to be seen. The notion is premised on the case that a greening growth is not only necessary, but is also efficient and affordable.[50] The application of the inclusive green growth framework to achieve sustainable development would ideally lead African governments to develop policy, law and supportive mechanisms to leverage private investments – which will not only impact positively on the poor, but will also contribute to the development of the green economy.

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9.
THE CURRENT STATUS OF BIOFUELS TO PROMOTE ENERGY SECURITY – LEGAL CHALLENGES AND POTENTIAL FOR SUSTAINABLE DEVELOPMENT IN SOUTH AFRICA

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1 Introduction

Various scientific studies have revealed that climate change has started affecting the atmosphere adversely and, of all the continents, Africa in particular is suffering detrimental consequences.[1] South Africa is experiencing an often subtle, yet steady, change in climate, and temperatures have risen significantly over the last 60 years and are predicted to continue their rising trend.[2] Governments all over the world have created policies and measures to reduce the carbon dioxide (CO_2) emissions that are mainly responsible for climate change.[3] As yet, developing African countries have been more concerned with the issues relating to accessing energy in order to improve industrial production and increase economic growth than with crafting policies that reduce carbon dioxide emissions or halt climate change.[4] Compared to other African countries, the South African economy is energy-intensive and the energy consumption rate is the highest in Africa.[5] However, only a small number of primary energy sources exist in South Africa, with limited substitution between energy carriers and an overwhelming reliance on coal.[6] Until the present time, energy efficiency and renewable energy were not considered to be an issue in South Africa.[7] In 2003 the South African government released a white paper on renewable energy which sought to set a target of producing 10 000 GWh of energy from renewable energy sources, specifically biomass, wind, solar

1 Lotz-Sisitka & Urquhart (2014:8); Meyer & Odeku (2009:49).
2 Griffin (2012).
3 Meyer & Odeku (2009); Johnson et al. (2007).
4 Davidson & Winkler (2003); van Vuuren (2008:54-55); Danish (2007).
5 Emissions statistics available at http://mdgs.un.org/unsd/mdg/SeriesDetail.aspx?srid=749, last accessed 15 January 2015; Meyer & Odeku (2009:49).
6 Tyler (2011).
7 Meyer & Odeku (2009:49).

and small-scale hydro, by 2013.[8] Based on the white paper[9] and its acknowledgement of the importance of a diversified energy supply mix, South Africa has also established several biofuel policies and mandates, such as the Biofuels Industrial Strategy of the Republic of South Africa, which was published by the Department of Minerals in December 2007.[10] The aim of this biofuels strategy was to achieve a 2% penetration of biofuels in the national liquid fuel supply, which represents about 30% of the national renewable energy target for 2013, as set out in the white paper on renewable energy.[11]

Biofuels have the potential to provide numerous environmental, and energy security and efficiency benefits for the South African economy, but large-scale biofuel production has not materialised yet.[12] Although biofuels are not new to South Africa, the national biofuels industry is still in its infancy.[13] Entrance restrictions are considerable and the energy market is presently monopolised by a single provider of electricity.[14] The key to success for biofuels development in South Africa is the implementation of a sound legal, policy and regulatory framework that will facilitate large-scale investments in this resource.[15]

But development of the biofuels industry has proved difficult and it seems that the national biofuels strategy hampers the establishment and expansion of the industry.[16] This situation is due to a lack of commitment from the South African government and an utter distortion of information on the current policy.[17] This makes a successful, comprehensive legal, regulatory and constitutional framework for the development of biofuels in South Africa all the more important.

8 Department of Minerals and Energy (1998).

9 While the Renewable Energy White Paper indicated that biofuels made from biomass were among the renewable energy sources under consideration in order to achieve industry viability, it was clear that the biofuels policy needed to be developed to a much deeper level than was laid out in the white paper.

10 Letete & Blottnitz (2012).

11 Biofuels Industrial Strategy of the Republic of South Africa, Department of Minerals and Energy (2007).

12 There is still no workable biofuel project up and running, despite many policy statements and plans for projects. South African Airways (SAA) will be powering some of its aircraft from fuel derived from tobacco in 2016. See Gilder & Mamkeli (2014).

13 During the past thirty years, two types of renewable fuels, biodiesel and ethanol, have been considered as products that could be produced locally. Biodiesel was considered, particularly by the agricultural industry, as a replacement for diesel in agriculture. The technical developments of manufacturing this fuel and proving its efficiency were conducted in the period 1979 to 1983. See: http://proteinresearch.net/index.php?dirname=html_docs_ 025biofuels, last accessed 15 January 2015.

14 Chambers (2006).

15 Odeku (2012).

16 Funke (2011).

17 (ibid.).

2 South Africa's Energy Policy

2.1 Introduction to the Energy Market

The South African economy is energy-intensive, meaning that the country uses a large amount of energy for every rand of economic output.[18] Economic growth and the demand for electricity in rural areas have increased the demand for electricity in South Africa.[19] Indeed, the publication released by Statistics South Africa (Stats SA) in 2014, containing the latest data on electricity produced and available for distribution, shows the amount of electricity used in 2013 as 256 073 GWh and an amount of 252 578 GWh in 2014.[20] Despite this small decrease South Africa's energy requirement, the demand is expected to double 2013 usage levels by the year 2030.[21]

The South African energy sector is very simple in structure because there are only a small number of primary energy sources, with limited substitution between energy carriers, and an overwhelming reliance on coal.[22] Coal-fired power generation provides over 80% of the country's electricity supply.[23] The country has large reserves of uranium, but only small reserves of oil and gas – which leads to the need for imports mainly from Saudi Arabia and Nigeria.[24] But dependence on outside sources leaves South Africa vulnerable to factors beyond its control, such as oil price shocks and supply disruptions due to political and other external factors. Price fluctuations result in a flow of foreign exchange resources to oil producers, which might otherwise have been used to stimulate the local economy. Other energy sources like nuclear and especially renewable energy are produced in such small quantities as to be of no consequence. This being so, South Africa continues its dependence on coal for the production of electricity.[25] This means that the country's economy is highly dependent on fossil fuels, and, it is one of the highest emitters of greenhouse gas per capita in the world.[26]

3 Renewable Energy Policy in South Africa

The global energy context shows that fossil fuels still dominate the system in South Africa. Not only in South Africa, but also worldwide, fossil fuels contributed 77,9%

18 Hughes et al. (2002).
19 Cigrasp (2013).
20 Statistics South Africa available at http://www.statssa.gov.za/?p=4045, last accessed 15 January 2015.
21 Cigrasp (2013).
22 Tyler (2011).
23 (ibid.).
24 36% (Saudi Arabia), 34% (Iran), and 16% (Nigeria) in 2006. Imports from Iran had ceased when Western nations imposed sanctions on that country. In 2013 45% of the oil came from Saudi Arabia and 23% from Nigeria; cf. Nkomo (2010).
25 Tyler (2011).
26 EREC (2011).

to the global energy system.[27] Despite this, renewable energies are steadily becoming a greater part of the global energy mix with double-digit growth rates being observed in the last decade for some renewable energy technologies.[28]

Most of South Africa's renewable energy is provided by biomass, which consists primarily of fuelwood used in households, which is harvested unsustainably, or of biomass, in the form of sugar cane.[29] Moreover, pulp mills generate electricity directly from bark and 'black liquor'. The wind energy contribution to South Africa's electricity supply is provided by the privately owned Darling Wind Farm in the Western Cape and Eskom's Klipheuwel Wind Farm.[30] With regard to hydropower, South Africa has only 668 MW of installed capacity.[31] Small hydro plants account for about 68 MW of this capacity. In addition, pumped storage schemes with a capacity of 1 580 MW have been installed.[32] South Africa's electricity access has grown by over 50% since 1994, but renewable energy is lagging behind.[33] South Africa's clean energy penetration stands at around 511 MW of installed capacity out of a national total of almost 43 GW.[34] However, in 2013, nearly 180 MW was added, mainly in the form of solar energy, and further expansion is planned.[35]

South Africa's history of using biomass as an energy source dates back to the 1920s when ethanol derived from sugar cane was mixed with petrol.[36] Between the 1970s and early 1990s South African involvement in the development of alternative fuel sources was largely in response to sanctions placed on the apartheid government.[37] There are currently no large-scale biofuel producers in South Africa, but there is much interest in this field in both the agricultural and corporate sectors.[38] Sugar producers and maize farmers represent the majority of the parties looking at driving the South African bioethanol industry.[39] Biodiesel, mostly from recycled sunflower oil, is produced on small scale – less than 300 000 litres per year – by many farmers and small companies across the country; and virgin soybean, and sunflower and canola oils have also been used for biodiesel production.[40] In 2014 South Africa consumed about 13,1 billion litres of diesel, and consumption is forecast to grow at 4,5% per year between 2012 and 2020.[41] Biofuels could be a partial solution for the problems mentioned in section 1.2

27 WEC (2013).
28 (ibid.).
29 Winkler (2006).
30 Peters (2013).
31 Banks & Schaeffler (2006).
32 (ibid.).
33 Fripp (2014).
34 (ibid.).
35 (ibid.).
36 von Maltitz et al. (2009).
37 Lynd et al. (2013).
38 Department of Minerals and Energy (2007).
39 (ibid.).
40 Letete (2009).
41 SAPIA (2013:6).

and could decrease South Africa's dependence on fossil fuels and imported oil, while also decreasing pollution and promoting the renewable energy production ratio. But, in order to promote the introduction and growth of renewable energy technologies, it is important to have government support.[42] The growth rate of such technology is responsive to the energy policy guidelines of a country.[43]

4 Biofuels Regulatory Framework in the Context of Climate Change and Energy Security in South Africa

4.1 Status of the Biofuels Industry

The increasing demand for energy has created a need for alternative energy sources.[44] In particular, this can be coupled to the large growth in renewable energy generation.[45] Biofuels have been promoted as an environmentally sustainable solution to the global and especially the South African energy crisis.[46] Although biofuels are mainly used to replace or supplement the conventional petroleum-based transportation fuels, they can also be deployed to generate heat and electricity.[47] Being an alternative to fossil fuels, biofuels can be applied to existing vehicles with little or no engine modification and, although they release carbon dioxide when burned in internal combustion engines, they differ from fossil fuels partly because their use reduces the net emission of carbon dioxide and other gases associated with global climate change and they are biodegradable.[48] Developing biofuels has many further advantages such as utilising renewable resources efficiently; enhancing energy security and energy supply diversification; enhancing rural agricultural development and investment in rural areas; reducing greenhouse gas emissions; and increasing jobs and improving livelihoods.

Global production of biofuels has been growing steadily from about 20 billion litres (125 million barrels) in 2001 to over 110 billion litres (692,5 million barrels) in 2011.[49] During this period, worldwide production of ethanol and biodiesel has increased almost five- and twenty-fold, respectively. Global biofuel production is projected to reach 222 billion litres by 2021, with an ethanol and biodiesel share of 81% and 19%, respectively.[50] In 2011, biofuels provided around 3% of total fuel for road transportation worldwide and it is projected to share 27% of world transport fuel by 2050.[51] The United States is the top producer of biofuels, followed by Brazil, whereas the global contribution

42 Girard & Fallot (2006).
43 Sebitoso & Pillay (2008).
44 Amigun et al. (2011).
45 Sebisoto & Pillay (2008).
46 von Maltitz & Brent (2008).
47 ResearchandMarkets (2015).
48 (ibid.).
49 US Energy Information Administration (2013).
50 Pradhan & Mbohwa (2014).
51 (ibid.).

of South Africa to biofuel production is well below 0,01%.[52] Indeed, South Africa's biofuel development has been stalled by a legislative process and biofuel is yet to be commercially produced on a large scale.[53]

Despite many policy statements and plans over the years, biofuel production in South Africa is still in its infancy.[54] Only a very few small-scale biofuel plants are available in the country.[55] South Africa has a much larger capacity for producing bioethanol than biodiesel. Currently, there are about 200 small entrepreneurs who produce biodiesel on a small scale, mostly using waste vegetable oil (WVO) as feedstock, which neither competes with food nor for agricultural land.[56] A major concern of these entrepreneurs is that the feedstock is too expensive. Furthermore, there is no uptake of biofuels because a mandatory blending does not exist.[57] The production rate of these plants is quite low because owners prefer batch reactors over continuous reactors because of low acquisition cost, simple design and ease of operation.[58] Ethanol, which is produced on small and medium scale, is mostly being used for non-fuel purposes.[59] Several large sugar companies like Illovo and Tongaat Hulett are producing bioethanol for the spirits and chemical manufacturing markets, but not for the liquid fuels market.[60] The lone producer of fuel bioethanol is Silversands Ethanol, located in Hoopstad in rural North West province, and manufactures bioethanol gel.[61] The gel is thickened bioethanol that can be used as a cooking and lighting substitute for paraffin.[62] Silversands grows and uses grain sorghum as the feedstock for bioethanol production.[63] The 2011 estimate of the production of ethanol and biodiesel in South Africa was only about 16 000 and 4 770 litres per day, respectively.[64]

4.2 Feasibility and Potential of Biofuels

Southern Africa – and especially South Africa – has been identified as an area with extensive biofuel potential, when compared to the rest of the globe.[65] Not only does

52 (ibid.).
53 (ibid.).
54 Esterhuizen (2009).
55 Avinash et al. (2014).
56 van Zyl & Prior (2009).
57 (ibid.).
58 Pradhan & Mbohwa (2014).
59 von Maltitz & Brent (2008).
60 Strydom (2009).
61 Silversands Ethanol, see: http://somnium.co.za/Silversands%20Ethanol/index.html, last accessed 4 March 2016.
62 (ibid.).
63 Grain sorghum was used primarily to avoid food scarcity concerns, and, during its recent expansion, Silversands kept the food security issue at the forefront.
64 Pradhan & Mbohwa (2014).
65 von Maltitz & Brent (2008).

South Africa have a climate suited to high levels of biomass production, but there is also the perception that much of its land is available for biofuel production.[66] The areas which constituted the former homelands in South Africa are suggested as appropriate for biofuel expansion, based on the view that the land is underutilised.[67] Furthermore, commercial farmers are keen on the establishment of a biofuels industry as they see it as a mechanism to boost agricultural production.[68] South African maize farmers, for instance, argue that they can produce 14 million tonnes of maize, but that the local demand is only 9 million tonnes.[69] South Africa has the technical potential to produce maize for biofuels and farmers believe that a bioethanol industry will help to stabilise the local market.[70] A study further revealed that South Africa produces about 18 million tonnes of agricultural and forestry residues, to which can be added more than 8 million tonnes of invasive species that would be available on an annual basis for more than a decade owing to abundant seed banks in infested regions.[71] Furthermore, it has been projected that an additional 67 million tonnes of energy crops per annum can be cultivated on only 10% of available land and that the total estimated biomass production capacity of South Africa is 94 million tonnes per annum.[72]

4.3 The South African Industrial Biofuels Strategy 2007

The South African government developed the Biofuels Industrial Strategy (BIS) to facilitate the development of an alternative energy source and to assist countries to move from a reliance on expensive, imported, carbon-intensive fuels to more diverse energy sources which include biofuels.[73] The BIS, developed in December 2007, signalled the government's support for the development of biofuels and the beginning of the biofuel industry in South Africa.[74] The BIS was developed by members of the Biofuels Task Team, which consisted of ministers from the agricultural, environmental, land affairs, energy, science and technology, and treasury departments and was formulated as a developmental strategy aimed at using biofuels development to achieve goals set forth by the various departments.[75] The aims of the strategy included attracting investment into rural areas, promoting agricultural development, alleviating poverty through sustainable income earning opportunities, and substituting imports of foreign oil.[76] Furthermore, the strategy aimed to achieve 2% penetration of biofuels in the national

66 (ibid.).
67 The areas that constituted the former Bantu homelands in South Africa are suggested for biofuel expansion based on the view that the land is underutilised.
68 von Maltitz & Brent (2008).
69 (ibid.).
70 (ibid.).
71 van Zyl & Prior (2009).
72 (ibid.).
73 Department of Minerals and Energy (2007).
74 Strydom (2009).
75 (ibid.).
76 Pradhan & Mbohwa (2014); Department of Minerals and Energy (2007).

liquid fuel supply by 2013, which is equivalent to 400 million litres per annum.[77] The 2% target should be achieved through a B2 or 2% blending level for biodiesel and an E8 or 8% blending level for bioethanol.[78] The strategy also estimated the creation of about 25 000 jobs in rural farming.[79] Finally it determined a contribution of up to 50% to the renewable energy target of 10 000 GWh by 2013.[80]

4.4 Biofuels Regulatory Framework

The main policy obstacle for biofuel development in South Africa is the absence of an implemented policy that takes into account the problems discussed in section 2 related to energy security and climate change, but also issues related to agriculture and land, water, and food security. There is a pressing need for the promulgation of a biofuels regulatory framework, policy and regulations – which are currently works in progress – to impose standard criteria for investments, targets for blending, and a price policy.

On 15 January 2014 the Department of Energy took the step of publishing its Draft Position Paper on the South African Biofuels Regulatory Framework, which included regulations on the mandatory blending of biofuel with petrol and diesel and a pricing framework. According to the document, the South African government had identified the biofuels industry as a potential major source of employment and economic development. However, the Department of Energy is still in the process of revising the position paper. Thus, the implementation of the draft position paper of January 2014 alone leaves gaps regarding the critical concerns mentioned above that arise in the Biofuels Strategy, 2007. The enormous development in the field of biofuels means that constant observation of the progress in biofuels generation is necessary. This requires role players, including policy makers, to be at the cutting edge of technology and feedstock breeding.

It is important to point out that South African government has already created the foundation for the biofuels industry. However, it fails to clear the last hurdle of resolving the remaining weaknesses in the draft position paper, and finally implementing it. Examples from other countries show what an important role a detailed biofuels regulatory framework can play for a nation's biofuels industry. Brazil is the second largest producer and consumer of bioethanol, and its soils and climate have similarities to those in South Africa. Both Africa and South America are widely recognised as the continents with the greatest potential to increase modern bioenergy production. As in South Africa, energy security is one of the key drivers of the expansion of ethanol and biodiesel production in Brazil, where domestic feedstock production is favoured as a means to substitute fossil fuel derivatives.

77 Brent et al. (2010).
78 Letete & von Blottnitz (2012).
79 Brent et al. (2010).
80 (ibid.).

4.5 Brazil's Biofuels Regulatory Framework – A Lesson for South Africa?

Brazil's success in the production of alcohol fuel is strongly related to the action of the state as a designer of public policies, as well as to the fact that the government has directly influenced the strategic decisions of the sector.[81] The setting up of a regulatory framework, the concession of credit, the establishment of research institutions and the incentives for the emergence of a domestic and international demand for alcohol fuel are some of the main factors that indicate that the government has been a driving force in the establishment of Brazil's biofuel model.[82]

In Brazil the central pillar of the biodiesel regulatory framework is the National Biodiesel Production Programme (PNPB), created by an inter-ministerial working group in July 2003.[83] The framework establishes guidelines pertaining to biodiesel production; certification and marketing for reasons of job increase; reduction of GHG emissions; guaranteeing of energy supply; creation of a competitive market; assurance of quality and supply from different raw material;, increase in exports; the gaining of more space in the international market; and internal and regional development based on feedstock production.[84] In 2004, the Brazilian National Congress drafted a project of law to include biodiesel as a renewable source in the Brazilian energy matrix, which was enacted by Provisional Measure n. 214/2004, and subsequently converted to Federal Law n. 11.097/05.[85] Many of the parameters above were later defined in Federal Law n. 11.116 of May 2005.[86] Moreover, Law n. 11.116 reduced tax percentages for biodiesel import and production, and delegated power to the Executive to further alter the sales and social security tax rates.[87]

Although mainly driven by economic incentives and market-based instruments, the new trend in Brazilian biofuels policies is to promote environmental best practices in its biofuels industry.[88] By incorporating this aspect of sustainability in its policy, Brazil has driven biofuel production from an idea to a corporeal industry that is supported and protected by public and private sectors in that country.[89]

South Africa already does have an established energy and fuel industry infrastructure with regulatory measures that relate to renewable energy and biofuels specifically, as the white papers and the Biofuels Industrial Strategy have shown.[90] What South Africa

81 Oliveira & Hira (2014).
82 (ibid.).
83 Teles da Silva & Dutra (2014).
84 (ibid.).
85 (ibid.).
86 Federal Law 11.116, available at: http://www.planalto.gov.br/ccivil_03/_ato2004-2006/2005/Lei/L11116.htm, last accessed 15 January 2015.
87 Teles da Silva & Dutra (2014).
88 Brits (2011).
89 (ibid.).
90 (ibid.).

should however learn from Brazil is that the constant implementation of legislative and legally binding rules regarding biofuels can have enormous positive implications for the biofuels industry and finally for energy security and climate mitigation.

The recent work of South Africa's Department of Energy regarding biofuels is already enough to fire the starting pistol for a successful biofuels market entrance. It will take a while to see in which direction biofuels production will develop. It is therefore important to monitor the permanent developments in a fluctuating industry like the biofuels industry. Problems which arise can easily be solved through observing the industry and adjusting rules, where necessary. But without any legally binding framework the biofuels industry will come to a standstill, which would be an enormous waste of the potential.

The example of Brazil shows the advantages that a biofuels industry can bring to a country. South Africa can be the role model for other countries on the continent and become the African leader in the biofuels market. The effects of climate change are already being felt and the energy crisis has created sporadic havoc since 2008 through load shedding, resulting in an enormous loss of money for the country. The time for change is now.

5 Conclusion

The current biofuels policy indicates that biofuel production in South Africa cannot and will not take place without an effective policy. The current lack of clarity about the implementation of the biofuels regulatory framework – coupled with a severe lack of commitment from the government, especially from the Department of Energy with respect to blending targets and price policy – is the industry's main drawback. The overarching conclusion of this article is that the development of the biofuels industry in South Africa could make a positive contribution to the development of South Africa's energy sector and to climate mitigation, and will become more important in the future, especially in respect of alternatives to increased fossil fuel combustion. There is a huge potential for biofuels in South Africa, but without further steps by the government, the biofuels industry cannot develop.

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10.
THE ROLE OF LAW IN PROMOTING RENEWABLE ENERGIES IN AFRICA

Yinka Omorogbe

1 Introduction

Energy is an indispensable component for modern life, and for sustainable development. While this statement is now almost an obvious fact, this was not the case a few years ago, at the turn of the century. At that time, there was the realisation that one-third of the world's population was poor, and that there was the need to tackle this problem head on. This led to the emergence of the Millennium Development Goals (MDGs), aimed at greatly reducing poverty and promoting sustainable development through the adoption of eight ambitious goals in 2000, to end in 2015. While the MDGs have underpinned development planning and activity since their inception, and have definitely contributed positively to poverty reduction worldwide,[1] they have failed to make maximum impact, because all, with the exception of the eighth goal, are unable to be realised in the absence of clean and efficient cooking and motor fuels, and the provision of electricity – which in combination are referred to as modern energy services. The Plan of Implementation of the World Summit on Sustainable Development held two years later, in 2002,[2] recognised this and incorporated action –

> to improve access to reliable and affordable energy services for sustainable development sufficient to facilitate the achievement of the Millennium development goals, including the goal of halving the proportion of people in poverty by 2015, and as a means to generate

1 The eight MDGs are as follows: Goal 1: Eradicate extreme poverty and hunger; Goal 2: Achieve universal primary education; Goal 3: Promote gender equality and empower women; Goal 4: Reduce child mortality; Goal 5: Improve maternal health; Goal 6: Combat HIV/AIDS, malaria and other diseases; Goal 7: Ensure environmental sustainability; and Goal 8: Develop a global partnership for development. For assessments of the success of each of the goals, see the Millennium Development Goals Report 2015, available at www.un.org/millenniumgoals, last accessed 18 January 2016.

2 The World Summit on Sustainable Development, held in Johannesburg, was the follow-up to the United Nations Conference on Environment and Development (the Earth Summit) held in Rio de Janeiro in 1992. See the Plan of Implementation of the World Summit on Sustainable Development, at page 5, available at http://www.un.org/esa/sustdev/documents/WSSD_POI_PD/English/ WSSD_PlanImpl.pdf, last accessed 18 January 2016.

> other services that mitigate poverty, *bearing in mind that access to energy facilitates the eradication of poverty*.[3]

The importance of energy access was further highlighted in another publication[4] which was totally devoted to an exploration of the need for energy services, as an essential prerequisite for the attainment of the MDGs. Titled *Energy Services for the Millennium Development Goals,* it directly linked the attainment of each of the MDGs to the provision of energy services, showing how a lack of these services directly impacted on and militated against the attainment of each goal. It recommended that the issue of energy services should be placed on a par with other MDGs, and that energy services should be integrated into national development strategies by "combining a goal-oriented approach to address the combined energy needs of social institutions and productive activities for cost-effective energy service delivery".[5] This recommendation was probably premised on the hindsight that the provision of energy services should have been an MDG, considering its overriding importance.

From the advent of the 21st century, there has been increasing awareness of the importance of energy to the eradication of world poverty. Thus 2012 was the Year of Sustainable Energy for All, and 2014–2014 has been designated as the Decade of Sustainable Energy for All. The MDGs have given way to the 17 Sustainable Development Goals (SDGs), of which the seventh goal is to ensure access to affordable, reliable, sustainable and modern energy services for all. Like the MDGs, the SDGs are mainly dependent on improved energy access for optimal success, and therefore it remains critically important for the attainment of several of the goals, particularly the first, which is the total eradication of poverty. See Table 1 below for a full list of the SDGs.

In 2015 the world had an estimated population of 7,3 billion people.[6] At the time of writing,[7] about 3 billion of these people lacked access to modern energy services, i.e. either a lack of clean cooking fuels or a lack of access to electricity, or both.[8] About 95% of the people in each of these categories are in Asia and sub-Saharan Africa. More troubling is the fact that, while appreciable progress has been made in Asia, particularly in India and China, African statistics show stagnation. Strategic action is needed to make energy access a reality for the energy poor. The premise of this article is that action to provide access to modern energy for the countries of Africa must involve increased use of renewables, and that law has a vital role to play in achieving success.

3 Emphasis by the writer.

4 See Modi et al. (2006).

5 Modi et al. (2006:2).

6 UN (2015:1).

7 January 2016.

8 Figures for those living without electricity vary between 1,3 and 1,4 billion, while nearly 3 billion people make use of traditional biomass and coal to meet their cooking needs. See http://www.undp.org/content/undp/en/home/ourwork/environmentandenergy/focus_areas/sustainable-energy/universal-access.html; http://www.se4all.org/decade; and http://www.unfoundation.org/what-we-do/issues/energy-and-climate/clean-energy-development.html?referrer=https://www.google.com.ng/, all accessed 25 January 2015.

This article discusses the role of law in promoting the growth of renewable energy in Africa and the imperative of increasing its use on the continent. The author sees renewable energy as the primary driver for granting access to energy services to the energy poor, and law as the catalyst for increasing its use. Thus the premise articulated in the article is that the increased use of renewables as a strategic tool for providing energy services will enhance and ensure the success of this objective.

The article first gives a brief description of Africa's energy resources, and then discusses access to modern energy services and energy poverty; and the state of energy poverty in Africa. The article then goes on to consider the centrality of policy, before highlighting the role law has to play as a catalyst for growth in the use of renewable energy, and actions to stimulate development, decrease poverty, and contribute meaningfully towards achieving sustainable energy for all.

2 Africa's Energy Resources

The writer likes to describe Africa as awash with energy resources.[9] Huge fossil fuel deposits are located all over the continent, in practically every country. While Nigeria, Libya, Angola, Gabon, Equatorial Guinea, Egypt and South Sudan are the better-known major producers, several countries have some ongoing activities in upstream petroleum, and promising discoveries have been made in countries such as Mozambique, Ethiopia and Namibia which are believed to hold sizeable reserves. East Africa holds vast potential, with Lake Albert in Uganda described as having 3,5 billion barrels of oil reserves.[10] There are even large amounts of shale oil and gas resources all over Africa.[11] However, since conventional energy in most of these countries is still underexplored, there has apparently been little or no impetus to consider critically the use of these alternative sources in most countries, the possible exception being South Africa.[12]

Even now, Africa could conveniently meet all its energy needs solely from conventional fossil fuels in Nigeria.[13] However, fossil fuels have the disadvantage of being major environmental pollutants and contributors to climate change. In addition, plunging oil prices over the past few months have rendered many new exploratory efforts and discoveries uneconomic for the moment.

Africa also has immense renewable energy resources that, like petroleum, remain underexplored and underutilised. The continent has abundant hydropower, with some

9 This section leans heavily on Omorogbe (2014a:470).

10 Hall & Diggens (2011); EIA (2013a).

11 EIA (2011); EIA (2013b). These studies show substantial deposits of shale gas in various regions of the world, including the African countries of Morocco, Algeria, Tunisia, Libya, Egypt, Mauritania, Western Sahara, and South Africa, and that most of the sub-Saharan countries contain at least modest reserves, and so it is reasonable to expect more shale discoveries.

12 Bagilet (2015); Lloyd (2015); There is substantial opposition, see www.frackingsa.org, last accessed 6 February 2016.

13 AfDB & AU (2009).

of the world's largest watercourses, such as the Nile, Niger, Zambezi, Limpopo, and Volta Rivers. Hydropower is the primary source of electricity, and is said to be more than sufficient for the continent's electricity needs. Africa can also harness energy from wind and ocean currents, as it is surrounded by the Indian Ocean on the east and the Atlantic Ocean on the west. Ocean-current turbines along the 2 000-kilometre northwest coastline from Morocco to Senegal could potentially generate all of Africa's energy needs. The most abundant renewable energy source available to the continent, however, is the sun, which shines all year round in most African countries.

Africa has extensive geothermal resources. The East African Rift Valley is one of the major tectonic structures[14] of the earth, where the heat energy of the earth escapes to the surface. It is very extensive and runs through several countries in east and central Africa. As most of these countries are net importers of energy, geothermal resources hold great promise for them.[15] Activities in this sector should increase in these countries, in the near future. Geothermal resources in the Red Sea Valley, between Nigeria's Atlantic southeast coast and Cameroon's Atlantic southwest coast, remain unutilised. South Africa, though relatively less well endowed, is said to be seriously considering the option of geothermal energy.

These statistics show that Africa is rich in both fossil fuels and renewable energy. With such abundance, no African should be energy poor. All its energy-deprived countries can potentially have all their energy needs met from the continent's resources. There is a critical need to increase energy use in accordance with principles of sustainable development, taking long-term environmental matters into consideration. While fossil fuels remain relevant as the motor fuel of choice, and the world's primary source of energy, renewables have an important role to play, particularly for a continent that is faced with the need to increase access to modern energy services to millions of people.

3 Modern Energy Services and Energy Poverty

The term 'modern energy services' refers to the benefits derived from the use of efficient energy sources, over and above that derived from basic biomass, which is basically wood and other unprocessed organic matter. The energy source that a person has defines the amount of energy at the disposal of that person and makes a fundamental difference to standards of living and available choices. These benefits include mechanical power for work, so that tasks are made easier, such as grinding corn or other grains, or harvesting crops; seeing by artificial light which is essential for reading, learning and greater productivity at night; cooking without having to forage for firewood or other basic biomass; cooling by refrigeration so that drugs can be kept at the right temperatures, and perishable food items do not have to be bought daily; using internet,

14 Tectonics is the branch of geology that studies the folding and faulting of the earth's surface. The term 'tectonic structure' is applied to various parts of the earth's crust that are formed by the combination of a number of different smaller structural forms. See www.definitions.net/definitions/tectonics, last accessed 25 January 2016.

15 Discussed in Omorogbe (2014a).

which allows for long-distance teaching, and communication with the entire world; using telecommunications which saves time that would otherwise have been spent on journeys in pursuit of transactions that cannot easily be concluded over the phone; and employing transportation, without which people would have to walk long distances, or travel by donkey, camel, horse or bicycle. Firewood, crop waste, dung, and wood shavings – the fuel of the poor – cannot provide such services and therefore the term 'access to energy services' implies access to services derived from more efficient fuels, which provide opportunities for greater productivity.[16]

Presently, about 1,2 billion people worldwide lack access to electricity totally, and another 1 billion people are serviced by unreliable electricity networks, such as those that abound in most of sub-Saharan Africa. All those living with unreliable electricity are energy deprived, and are forced to spend a lot of money on self-generation using diesel and petrol generators, an expensive and environmentally unfriendly option. Nigeria is a perfect example, with 24 hours of uninterrupted electricity in any part of the country being an extremely rare occurrence. According to the World Economic Outlook 2015, of the 1,2 billion people living without electricity (which excludes those with unreliable electricity) 1,1 billion reside in Asia and Africa.[17] Similarly, of the 2,7 billion that still rely on traditional uses of biomass for cooking, 2,6 billion live in developing Asia and Africa.[18]

Without modern energy, life is constrained and primitive, irrespective of where people live. Lyndon Johnson's biography[19] contains graphic descriptions of life without electricity in rural Texas, USA, detailing the harsh rigours of washing clothes, fetching water from far streams or deep wells, preparing animal feeds by hand, and working the long dawn-to-dusk hours that have been the fate of the rural poor for centuries. Descriptions of this nature still hold true for the energy poor in Africa today.

The absence of modern energy affects the standard of teaching that people will receive at school, as teachers will not usually want to work in a place without electricity, nor will they gravitate to places without modern sanitation, which is directly impacted by the lack of energy. Environments lacking modern energy affect people's health as, again, such areas have very few doctors or health workers for the same reasons. Many vital drugs have to be kept at specific temperatures, and sudden illnesses or labour do not wait for daylight. To be rushed to a hospital at night in a place without electricity is to risk being attacked by miscreants or animals along on the way, and to be treated with unsterilised instruments – with only candles, kerosene lamps or primitive wood torches as illumination. Farming is an arduous task in the absence of mechanisation, and the

16 See Omorogbe (2014b).

17 See the WEO 2015 Electricity Access Database, available at http://www.worldene.rgyoutlook.org/resources/energydevelopment/energyaccessdatabase/, last accessed 25 January 2016.

18 See the WEO 2015 Biomass Database, available at http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/, last accessed 25 January 2016.

19 Caro (1990:especially 52–53 and 504–505).

average farmer has to work from dawn to dusk. While poverty and malnourishment are entwined, the latter is worsened by the absence of modern energy, as productivity is diminished, and perishable foodstuffs cannot be preserved. Children born in such conditions are, from the outset, severely disadvantaged, as they are immediately exposed to disease from unsafe water, and to inhaling particulate matter from woodstove fumes in the kitchen while their mothers are cooking. For girl children, the tasks of fetching water from the stream and gathering firewood for cooking could keep them from going to school. For many communities school is some distance away, and in these schools there are no sanitation facilities, nor even pit latrines. Particularly for girls, the danger factors inherent in long walks along lonely paths, and having to go into the bushes to relieve themselves, add to their non-attendance of schools and thus the number of uneducated girls in these areas. All this and more perpetuates the continuation of the cycle of poverty and deprivation, and to the non-realisation of the primary SDG goal, which is to end poverty in all its forms everywhere.[20]

4 Energy Services in African Countries

More than 620 million people in sub-Saharan Africa live without electricity,[21] and nearly 730 million rely on biomass[22] for their cooking and other energy needs. Most of these people reside in rural areas, unconnected to existing electricity grids and far away from markets for clean fuels.

Electricity access in Africa varies widely, ranging from 100% in North Africa, to 3% in Cape Verde and the Central African Republic (see Table 2 below). While some progress has been made in gaining access in countries such as Nigeria, Mozambique and Ghana, population growth currently outpaces present actions to increase access and therefore the number of people without electricity is projected to grow. Some regional variations may be seen. By contrast, all the people resident in the North African countries of Morocco, Algeria, Tunisia, Libya and Egypt have practically 100% access to electricity, and South Africa has an 84% access rate.

20 See http://www.worldenergyoutlook.org/resources/energydevelopment/modernenergyforallwhyitmatters/, last accessed 25 January 2016.

21 IEA (2014:30).

22 (ibid.:34).

Table 1: *Sustainable Development Goals*

	SUSTAINABLE DEVELOPMENT GOALS
Goal 1	End poverty in all its forms everywhere.
Goal 2	End hunger, achieve food security and improved nutrition, and promote sustainable agriculture.
Goal 3	Ensure healthy lives and promote well-being for all, at all ages.
Goal 4	Ensure inclusive and equitable quality education and promote life-long learning opportunities.
Goal 5	Achieve gender equality and empower all women and girls.
Goal 6	Ensure availability and sustainable management of water for all.
Goal 7	Ensure access to affordable, reliable, sustainable, and modern energy for all.
Goal 8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all.
Goal 9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.
Goal 10	Reduce inequality within and among countries.
Goal 11	Make cities and human settlements inclusive, safe, resilient and sustainable.
Goal 12	Ensure sustainable consumption and production patterns.
Goal 13	Take urgent action to combat climate change and its impacts.
Goal 14	Conserve and sustainably use the oceans, seas and marine resources for sustainable development.
Goal 15	Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests,combat desertification, halt and reverse land degradation, and halt biodiversity loss.
Goal 16	Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable and inclusive institutions at all levels.
Goal 17	Strengthen the means of implementation and revitalize the global partnership for sustainable development.

Source: The Sustainable Energy for All website: www.se4all.org, last accessed 16 February 2016.

The millions of people in sub-Saharan Africa who rely on traditional biomass as their primary source of fuel, reside mainly in the rural areas. Cooking is done using inefficient stoves, often in inadequately ventilated spaces. As cooking is traditionally a female chore, women and infants are inordinately affected by respiratory diseases caused by the inhalation of particulate matter from biomass combustion.

Biomass is mainly good for cooking; basic lighting using wood torches; and ironing, using charcoal irons or flat irons that are heated on coal. It does not support motor engines, cooling devices, or any modern inventions that make life easier. Some opine that firewood is the fuel of choice for many people, and a 'cultural factor'[23] is then cited or alluded to. The genesis of this probably stems from the variation in taste between some foods that are cooked on a gas stove, as opposed to firewood, with the latter being more tasty. In the same way smoked salmon owes its distinctive flavour to the fact that it has been wood smoked. Invariably, those making this assertion are not the ones doing the cooking, and therefore the opinion here is that this point of view has both gender and class dimensions, reminiscent of the mythical 'merry peasant'[24] mentality that assumes that a woman foraging for wood is doing so because she wants to prepare a tasty dish for her family. It is difficult to believe that persons would select firewood as the daily fuel of choice if they were doing the cooking themselves.

In Nigeria, the erratic energy supply all over the country has led to the ubiquitous use of generators of all shapes and sizes. Practically every Nigerian urban dweller who can afford one has a generator in the office and home. During the periods of blackouts, which are a daily occurrence, a typical produce market has several small petrol generators chugging, with the air filled with the smell of engine fumes. These same generators dot the corridors of houses of the urban poor. Periodically, the story is heard of a family that inhaled the fumes and was found dead the next morning. In wealthier parts of town, every home has a large generator that can carry all appliances that go with modern living. Industries, manufacturers, industrial buildings, hospitals and even larger law firms often have two good-sized generators. All this adds to the cost of business and creates an increasingly polluted and unhealthy environment.

23 (ibid.:36).

24 An allusion to the children's piano piece, 'The Merry Peasant,' by the classical composer Robert Schumann, Op. 68, No. 10, listen at https://www.youtube.com/watch?v=-ty6xdL9Ftc, last accessed 25 January 2016.

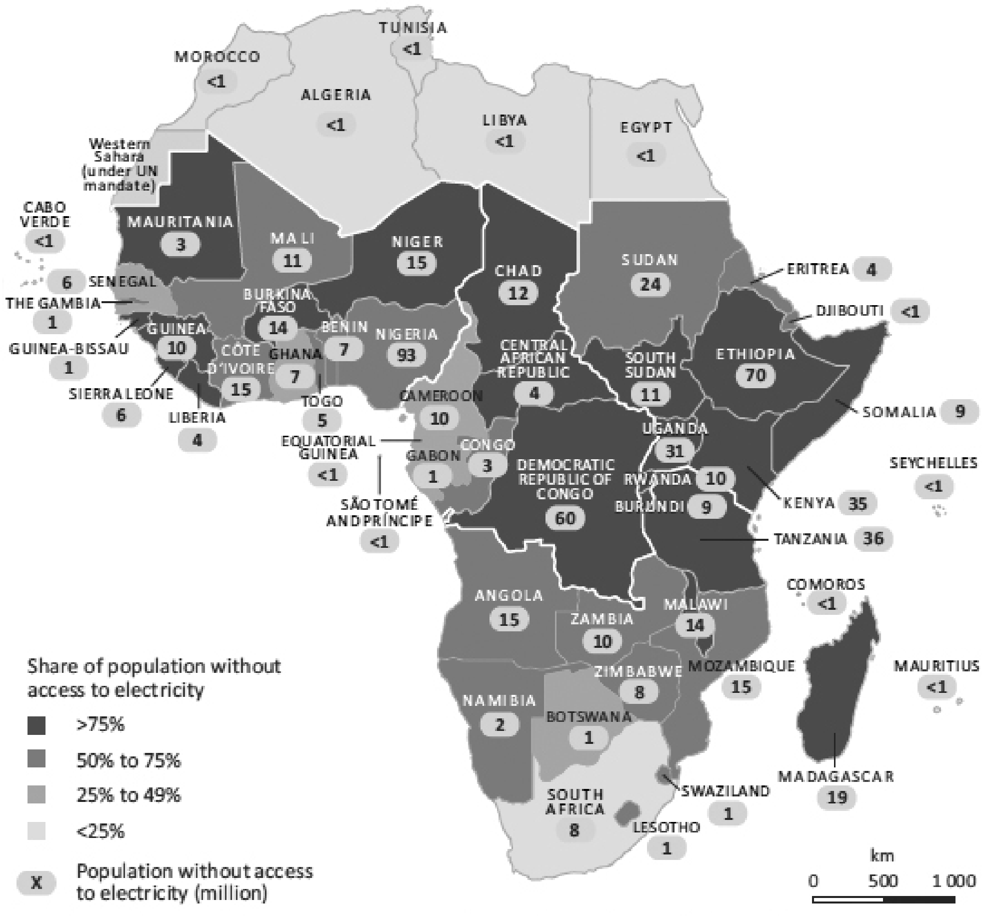

Figure 1: Number and share of people without access to electricity by country[25]
Source: IEA (2014).

5 The Centrality of Focused Policy

The terms 'policy' and 'law' are often used interchangeably. However, the former belongs in the realm of public administration, while law is a function of the legislative arm of government. While policies are statements of direction and intent, laws are the instruments that render these statements as provisions that must be complied with, and provide the parameters within which activities in furtherance of the stated policy objectives will be carried out. Both are essential components for good planning, and successful execution is dependent on the extent to which both are in harmony. Invariably, a country that is not measuring up to supposed parameters has a problem with articulated policy.

25 IEA (2014).

Figure 1 is noteworthy from a policy perspective, when considering factors responsible for the present situation within which millions of people live without access to modern energy in several parts of Africa. The first striking point is that the energy famine has not affected all of Africa. Sub-Saharan Africa is the most affected. The North African countries of Morocco, Tunisia, Algeria, Libya and Egypt all have 99% access rates, some of the highest in the world. Clearly, geography plays no part, as the access rates of Mauritania[26] and the Sudan show. Similarly Lesotho and Swaziland would have the same high access rate as South Africa, the country that surrounds them, if that were the case. Race also plays no part, as Namibian access rates are the polar opposite of South Africa's, even though both have significant white minority populations.[27] It might be tempting to ascribe Namibia's poor access rates to the dominance of the white minority, and South Africa's far better rates to the emergence of a black government, particularly when one finds that the Namibian national electrification rate of 32% consists of a 50% urban percentage of access against the rural rate of 17%.[28] However, a further look shows that not only is this disparity between urban and rural electrification not unusual in Africa, but it is much better than the situation found in the mono-racial black African countries of Burkina Faso (56% and 1%), Cameroon (88% and 17%), Gambia (60% and 2%) and Niger (62% and 4%).

A deeper look at South Africa, and the North African countries, shows that in all these countries priority has been given to electrification of the entire country, and to access to energy for all, including those in rural areas. In the words of the minister of Energy in South Africa (at the time of publication):[29]

> When the newly-elected government of South Africa assumed office in 1994, it was faced with a myriad of infrastructure and service delivery backlogs. Prior to 1994 the minority white population were the main beneficiaries of the government's energy investments in the residential sector. Since democracy however, access to electricity by urban and rural households across class and racial categories has become a core priority of the state.
>
> A famous quote says that 'Discipline is the bridge between goals and accomplishment.' Government's discipline and clear vision to ensure that all South Africans have universal

26 In Mauritania, 57% of the population makes traditional use of biomass, while the national electrification rate is 28%. In South Sudan and Sudan, electrification rates are 1% and 35% respectively. The percentages of people traditionally cooking with biomass are 98% and 70% for South Sudan and Sudan. See tables on traditional use of biomass for cooking in Africa (2012), and Electricity Access in Africa (2013), both available within the WEO 2015 Electricity Access Database and the WEO 2015 Biomass Database at http://www.worldenergyoutlook.org/resources/energydevelopment/energyaccessdatabase/, last accessed 25 January 2016.

27 While white populations are a negligible minority in most African countries, whites are 6% of the population in Namibia, and 8,4% in South Africa. See Namibia Demographic Profile, www.alexmundi.com, last accessed 19 January 2016; and www.statssa.org, last accessed 19 January 2016.

28 See Electricity Access in Africa 2013 in IEA (2015).

29 Republic of South Africa (2012:1).

> access to modern energy is evident in the progress from 1994 to 2012 whereby government successfully increased the proportion of households that have access to energy from 30% to 87%.

South Africa has remained in the forefront of energy access in sub-Saharan Africa, primarily because of the objective of its focal policy when considering national energy access. The quotation is instructive, and highlights the fact that successful implementation is the product of intent backed by good policy. The same can be said of Egypt,[30] Tunisia, Morocco, Libya[31] and Algeria, which owe their respective successes to effective policies backed by law.[32] South Africa's Energy White Paper gave policy direction for the National Electrification Programme, and the Integrated National Electrification Programme, with the latter providing for non-grid electrification and increased use of renewables. South Africa's primary policy objective has meant that the government sees energy access as a necessity, if not as a right, and as being essential to sustainable development. It is therefore willing to promote expansion through the use of incentives that recognise the lower purchasing power of the targeted communities. Between 1991 and 2001 Eskom, the electricity public utility, financed energy access through a cross-subsidy of industrial users and bulk sales to local authorities.[33] When it became obvious that electrification of these communities could not be self-funding, a South African Electrification Programme commenced under which part of the electricity costs are borne by the government and the connection fee is nominal. Under Free Basic Electricity, introduced in 2004, poor households get the first 50 kWh free. Furthermore, renewable energy electrification is subsidised at both investor and consumer levels.

Similarly, the North African countries each achieved near universal access because of policies that emphasise the need for energy as a critical factor in development, accompanied by the enactment of supporting laws and the creation of institutional frameworks. Morocco and Tunisia are both positive examples which show the primacy of good policy for success in energy access. Both countries are dependent on imported energy.[34]

A premise of this chapter is that the primary factor militating against access to energy services is the failure to put rural persons at the centre of policy and development, and to accept that the provision of energy services to them is essential for their sustainable development. A denial of access to energy services to those persons amounts to the

30 See AfDB (2010).

31 Libya's domestic energy is primarily from petroleum. It has Africa's largest reserves. See EIA (2015).

32 See UNECA (2012).

33 South African Electrification Programme, GNESD website, http://energy-access.gnesd.org/cases/22-south-african-electrification-programme.html, last accessed 25 January 2015. See also Republic of South Africa (2012). For a comprehensive view, see Glazewski (2006); Odeku (2012); Winkler (2006).

34 Although Tunisia is also a crude oil producer its domestic supply is predominantly from imports. See https://www.iea.org/Textbase/npsum/morocco2014sum.pdf; with regard to Morocco, see https://www.iea.org/countries/non-membercountries/morocco/, last accessed 25 January 2016.

perpetuation of an environment within which their basic human rights to life, dignity, health and education cannot be realised. In the same way as people have to be at the centre of development, rural dwellers have to be at the centre of policies, laws and actions to promote energy access.

For energy access to be successful, the objective of increment cannot be expressed in terms of percentages or numbers of people alone. It has to include means of assessing the extent to which there has been penetration into previously unreached areas of the country. To do this successfully the focus cannot be on an increase in the amount of people who now have electricity, or who are now cooking with clean fuels. It has to be on ensuring that any percentage increments include the provision of modern energy to the least advantaged populations in rural and inaccessible places. Disadvantaged rural persons have to be the ultimate beneficiaries.

If access to energy in developing countries is to be successful, policies should include:

- the objective of access to energy for all, by a specified date and incorporating targets for achieving 100% access to electricity and to clean energy for the entire population, rural and urban, with a designated percentage of access being from renewable energy;
- the use of renewable technology as an essential component of achieving connectivity for off-grid communities; and
- the use of appropriate and renewable technologies for clean energy fuels.

Good policies in this area must recognise at the outset that the poor cannot pay economically viable prices for electricity, let alone for clean cookstoves, and therefore the state should acknowledge the need for state-funded access programmes from its own revenues, or from other avenues. In practice, financing energy access for the poor, and stimulating growth in renewables, comes from three main sources: from financing by the energy investor, from revenue allocated for the purpose by the state, or from banks or equity markets.[35] As rural access is a socioeconomic necessity targeted at the poor, the state is the major funder, either from its budget, or from grants given to it for this purpose, Development finance plays a key role, from development banks and organisations such as the African Development Bank,[36] the Opec Fund for International Development,[37] the European Union,[38] the Power Africa Initiative[39] and

35 See http://www.worldenergyoutlook.org/resources/energydevelopment/energyforallfinancingaccessforthepoor/, last accessed 25 January 2016.

36 For more information see www.afdb.org, last accessed 16 February 2016.

37 For more information see www.ofid.org, last accessed 16 February 2016.

38 For more information see www.europa.eu, last accessed 16 February 2016.

39 An American Presidential initiative to support economic growth and development in Africa through promoting the use of affordable, reliable and sustainable power in Africa. The programme is designed as a multi-stakeholder partnership between the US government, governments of some African countries, the private sector in Africa and the African Development Bank. See 'Power Africa Initiative' at http://www.afdb.org/

the Global Alliance for Clean Cookstoves.[40]

Whether or not they are contained in the policy documents, the specific incentives must be contained in laws, so that a definable and enforceable structure can be created.

6 The Role of the Law

Law acts as a policy enabler. In other words, it creates the necessary legal obligations and rules that regulate the activity in question, ideally in alignment with the policy. Failure to do this will lead to a distorted legal environment, and to policy failure. Law is an indispensable requirement for societal change, within both international and municipal legal systems. The ravages of war in the first half of the 20th century, as illustrated by World Wars I and II, were instrumental in providing the impetus for the growth of international humanitarian law, which is now defined by the Geneva Conventions of 1944.[41] Similarly, recent years have seen a growth in laws aimed at both discouraging terrorism, at both international and municipal levels. At international law levels, the realisation that basic human rights are incapable of attainment in the absence of energy services has driven the evolution of the human right of access to energy services, which has achieved a measure of recognition in development-oriented quarters as a concept to be taken into account, if not accorded the full status of a human right.[42]

The indispensability of law as a tool for change is premised on the fact that law creates the operational environment, which may either be enabling, or so restrictive as to inhibit the growth of a desired activity. It is an essential accompaniment to policy, as the success of the latter is dependent on the efficacy of its accompanying law. It has the capacity to promote desired activities and discourage undesirable ones. For instance, a desired activity may be stimulated through the use of incentives laid down in law, or through laws that provide for a simplified process of approval, and the minimisation of bottlenecks, thus enabling easier administration. Provisions for incentives, reduced taxes, subsidies and speedy administrative procedures are examples of devices used by the law to stimulate change in a desired direction. Conversely, higher taxes, provisions that provide for approvals from several government agencies, and outright

fileadmin/uploads/afdb/Documents/Publications/Power%20Africa%20Initiative%20 Brochure.pdf, last accessed 16 February 2016; 'Fact Sheet: Power Africa' https://www.whitehouse.gov/the-press-office/2015/07/25/fact-sheet-power-africa, last accessed 16 February 2016.

40 This is a public-private sector initiative that is supported by the United Nations Foundation to promote the large-scale adoption of clean and safe household cooking solutions. See http://www.unfoundation.org/what-we-do/campaigns-and-initiatives/cookstoves/; also www.cleancookstoves.org, last accessed 16 February 2016.

41 See generally the website of the International Committee of the Red Cross (ICRC), www.icrc.org, last accessed 25 January 2015.

42 Bradbrook (2005); Bradbrook & Gardam (2006); Bradbrook et al. (2008); UNDP (2005); Omorogbe (2008).

prohibitions are ways of reducing activities that the government wants to discourage. Both instances involve the intentional use of the law to stimulate change.

In this sense, the law is never neutral. It is always promoting or discouraging an activity, intentionally or otherwise. Obscurely drafted provisions that convey unclear meanings can both discourage an interested investor, or encourage an unscrupulous person to take advantage of loopholes created as a result. Not only must there be law, but it must be clear, coherent, and easy to understand, as law gives the certainty and predictability that are necessary for investors and people whose lives may be affected by the activity in question.

Where policies and laws are in alignment, implementation that is not in accordance with laid down policies and laws can totally freeze desired activity. That has occurred in Nigeria where regulations on renewable energy stipulate an incentivised price at which generated electricity is sold to transmission companies.[43] In practice, the price that the Nigerian Bulk Electricity Trading Company (NBET) verbally states that it will pay for solar generated electricity is much lower. The result is that electricity generated from renewable energy is not commercially feasible in Nigeria. Technically, non-compliance with a law or regulation is illegal, but unfortunately is not an infrequent occurrence in Nigeria. Disconnects between policy, law, and implementation by designated institutions create distortions that have a negative impact on the operating environment.

At municipal levels, a legal framework to stimulate growth in energy services, and particularly to advance the use of renewables, must include clauses that encourage the provision of electricity for urban and rural populations, and adequate and affordable motor fuels that promote efficient transportation services. It should also include provisions that support a switch away from less efficient and primitive sources of energy such as firewood, to biofuels, and provide for mechanisms that would make the switch affordable and practicable. These laws would also have to enable effective administrative action to encourage this switch. For example, whether the switch is from firewood to natural gas, to liquid petroleum gas (LPG), or to a solar stove will often depend on sensitisation of the populace as to the merits and demerits, and on increasing affordability, either through lenient payment plans, or the use of targeted subsidies. For the energy poorest, nothing is affordable without payment options premised on the socioeconomic and security reasons why there must be improved energy access. In some instances (such as where the desired switch is to renewables with accompanying high infrastructure and start-up costs) only subsidies may suffice.

In practice, some incentives include feed-in tariffs, tax incentives, rebates for purchasing renewable generation equipment, and net metering.[44] It has been stated that feed-in

43 See Multi-Year Tariff Order for the Determination of the Cost of Electricity Generation for the period 1 June 2012 to 31 May 2017, http://www.ecowrex.org/system/files/documents/2012_multiyear-tariff-order-generation_nerc.pdf, last accessed 9 February 2016.

44 See http://www.eia.gov/todayinenergy/detail.cfm?id=11471, last accessed 16 February 2016.

tariffs, hold the most promise. The challenges are for the legal draftsmen to structure laws that advance state objectives.

7 Rationale for Increased Use of Renewables in Africa

African countries should promote the use of renewable energy. It is a vital ingredient for sustainable development, particularly because renewables can facilitate the realisation of energy services for the poor. There are several reasons for this perspective. The first has a bearing on energy security and applies primarily to petroleum-importing African countries. Energy security has been defined as the provision of adequate, affordable, efficient and reliable energy services with minimal adverse effects on the environment.[45] Within this definition is the component of security of supply, with emphasis on a preference for domestic sources over imported energy. It has earlier been stated that Africa has abundant renewable energy. From an energy security perspective, any petroleum-importing country should aim at an energy mix that relies on readily available internal sources, with solar energy having a particular appeal. The second reason applies to all countries, and has to do with the overriding need for increased energy access for all, including the energy poor for reasons of sustainable and national development, but also because of the security implications of having great disparities and inequalities in a state, bearing in mind that poor and disadvantaged communities are fertile breeding and recruitment grounds for extremist groups. As most electricity grids in Africa cover less than half of the respective countries, extending a grid is an expensive and uneconomical option, particularly as poor communities often cannot pay for electricity. This means that several millions of people will continue to live without that energy service, in the absence of renewable energy. Off-grid solutions are necessary. While fossil fuels are used for this in areas where there is no alternative, such as Alaska,[46] solar energy or a hybrid of solar and fuel are preferred options.

The third reason is environmental. Apart from the global climate change perspective, promoting the use of renewables will lead to cleaner cities and urban environments. Cities like Lagos, which suffer from the problems of erratic power supply coupled with pollution caused by the millions of generators in use whenever the regular blackouts occur, stand to gain from increased use of cleaner forms of energy.

As the poor cannot pay economically sustainable prices for electricity, or even for clean energy cooking stoves, energy access – with or without the use of renewables – is not a commercial venture. The state must fund access programmes from its own revenues, or other avenues, even as it makes long-term commitments to programmes in alignment with these objectives. In practice, financing energy access for the poor, as well as stimulating growth in renewables, comes from three main sources: financing by the energy investor, revenue allocated for the purpose by the state, or loans from banks or equity markets.[47]

45 Omorogbe (2004:124) quoting Davidson.

46 Electricity for rural communities is from diesel generators in Alaska. See http://www.eia.gov/state/?sid=AK, last accessed 25 January 2016.

47 See http://www.worldenergyoutlook.org/resources/energydevelopment/energyforall

As rural access is a socioeconomic necessity targeted at the poor, the state is the major funder, either from its budget, or from grants given to it for this purpose. Development finance plays a key role, from development banks and organisations such as the African Development Bank,[48] the OPEC Fund for International Development,[49] the European Union,[50] the Power Africa Initiative[51] and the Global Alliance for Clean Cookstoves.[52]

8 Conclusion

Countries that recognise the importance of energy to sustainable development are also aware that energy access is not just an economic venture, but a necessary objective premised on development and security perspectives. Within the energy mix, renewables have definite roles to play in ensuring access for remote locations and poorer societies, in reducing the carbon footprints of respective countries, and in promoting cleaner societies. It is essential for renewables to be incorporated into the energy mix of the countries of sub-Saharan Africa. Success will come from the creation of appropriate coordinated policy and legal frameworks, which encourage increases both in energy access and in the use of renewable energy.

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48 See AfDB (2012).

49 "OFID considers access to affordable, reliable, and sustainable modern energy services a prerequisite for the attainment of all the SDGs. Energy is placed at the core of our strategic framework, making us a key partner in the UN-led SE4ALL initiative. OFID is committed to scale-up its contribution to the protection of the environment by supporting all types of lower carbon energy services and efficient technologies to provide modern energy access to people without electricity and those who are using biomass for cooking and heating." See Statement by the OPEC Fund for International Development – OFID – at COP21, Paris, delivered by Mr Suleiman Jasir Al-Herbish, OFID director-general during the Joint High Level Segment (HLS) of the COP21 nad CMP-11, 8 December 2015, available at https://unfccc.int/files/meetings/paris_nov_2015/application/pdf/cop21cmp11_hls_speech_ofid.pdf, last accessed 23 January 2016.

50 See EC (2015).

51 See the website of the Power Africa Initiative of USAID, especially the *Beyond the Grid* page, available at https://www.usaid.gov/powerafrica, last accessed 23 January 2016.

52 See www.cleancookstoves.org, last accessed 23 January 2016.

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SECTION III:
INCENTIVE STRUCTURES

11.
LEVERAGING PRIVATE CAPITAL FOR RENEWABLE ENERGY IN NAMIBIA – A PRACTITIONER'S PERSPECTIVE

Jan Martin Witte

1 Introduction

Almost all countries in sub-Saharan Africa, including Namibia, are currently experiencing a major electricity crisis. Many of them are confronted with significant supply shortages, which mean that power service is intermittent, especially during hours of peak demand. These supply shortages hit the productive sectors in these economies especially hard, since they either face production interruptions or have to mobilise expensive thermal generators to keep production going. Owing to rampant supply shortages, and despite massive potential for the development of renewable energy, almost all African nations have had to contract expensive emergency thermal generation plants in recent years, undermining efforts to move towards cost-reflective tariff levels and putting further stress on public finances. To develop the significant renewable energy (RE) potential that exists, and thus to address the major electricity crisis with which they are confronted in a sustainable manner, countries in Africa need to find ways to leverage private investment. In principle, Namibia is well positioned to do so. With a long history of political stability and a general legal and regulatory framework quite favourable (if yet untested) to private investment, and as a creditworthy off-taker, Namibia has attracted significant interest from local as well as international developers and banks to harness its huge and affordable solar, wind and biomass potential for power production. However, in order to unlock this significant potential, the government of Namibia needs to take additional steps. Beside creating a reliable and supportive legal and political framework and a tariff regime for small to medium-size RE generation, the government will have to provide adequate support for independent power producers (IPP) in the form of an implementation (or government) agreement for middle- to large-scale RE generation (e.g. > 5 MW) that is in line with regional market practice. Such an agreement must, for example, include standard provisions such as change in law protections, which are critical for project finance deals to become bankable. Namibia has started to experiment with reverse auctions for solar photovoltaic (PV) capacity, and is also in the process of designing a renewable energy feed-in tariff (REFiT) for RE generation below 5 MW. As these promotional programmes are further developed, it would be beneficial to incorporate relevant lessons learned from implementation of similar programmes in other markets in the region, specifically South Africa. Considering the fact that the South African rand and the Namibian dollar are pegged, there may also be value in exploring the potential for cooperation with South Africa's successful RE IPP Procurement Programme (e.g. through joint tendering to benefit from economies of scale in tariffs).

2 The Electricity Crisis in Sub-Saharan Africa

Sub-Saharan Africa is characterised by extreme energy poverty. Only a small minority of the population has access to modern energy services (defined here as either on-grid or off-grid power connections). Where power is available, per capita electricity consumption remains very low. More than 90% of primary energy consumption on the continent is being served through the unsustainable use of biomass (firewood, charcoal, etc.).

Historically, low access to modern energy services has been the result of restricted geographic access to the power grid, high tariff levels, as well as high initial connection charges. In addition, today almost all countries in sub-Saharan Africa are confronted with a significant supply shortage, which means that there is simply not enough power around to serve additional demand. In fact, for existing customers power service is often intermittent, especially during hours of peak demand. These supply shortages hit the productive sectors in these economies especially hard since they either face production interruptions or have to mobilise expensive thermal generators to keep production going. In fact, owing to rampant supply shortages, and despite massive potential for the development of renewable energy, almost all African nations have had to contract expensive emergency thermal generation plants (usually based on diesel or heavy fuel oil) in recent years that produce power at levelised tariffs of between US$c20 and US$c35 or more, undermining efforts to move towards cost-reflective tariff levels and putting further stress on public finances. Finally, dilapidated distribution networks (a result of decades of underinvestment) and rampant electricity theft mean that electricity losses in the region are extremely high, varying between 20% and 30% across the region.

Thus, sub-Saharan Africa is confronted with a massive electricity crisis that undermines sustainable socioeconomic development and contributes to environmental destruction and climate change due to reliance on unsustainable biomass in the absence of reliable and clean power. A massive investment programme is needed to foster access to modern (i.e. renewable) energy services in all these countries. At the continental level, various estimates for these investment requirements exist. The World Bank estimates that to ensure security of supply, countries in sub-Saharan Africa will need to build 7 000 MW of additional generation capacity per year; realise more than five million new power connections per annum; and make significant investments into additional transmission and distribution infrastructure to keep the lights on. The annual financing requirements for these investments are staggering, and are estimated to hover around US$41 billion per annum for the next seven years. The Programme for Infrastructure Development in Africa (PIDA) estimates that the implementation of 15 priority electricity infrastructure projects will require roughly US$40 billion of investment until 2020.

This power sector investment challenge cannot be addressed by governments alone. In all countries in sub-Saharan Africa, weak tax revenues (15%–23% of GDP) and low (and costly) borrowing capacity (especially for former heavily indebted poor countries countries) mean that the ability to finance the massive expansion needed in the power sector does not currently exist. Also, even with positive macroeconomic development, public finance committed to infrastructure development has remained stagnant in recent years. The global financial crisis has also adversely impacted on infrastructure spending by governments in a significant manner.

Official Development Assistance (ODA) has re-emerged during the past decade as an important source of finance for renewable energy investments in the region, but will remain utterly insufficient to confront the challenges at hand. A new and potentially significant source of financing for power sector investments has recently emerged in the form of so-called New Donors, such as China, India, and the Gulf States. However, New Donor investment has thus far been focused primarily on resource-rich economies, and often comes in the form of resource exchange deals. In the renewable energy realm, the most significant portion of New Donor support has gone to a select number of large hydro power stations.

3 Key Hurdles for Private Sector Investment in Renewable Energy

Thus, at the end of the day, the massive investment required to develop renewable energy in Africa and to ensure security of supply will have to come from the private sector. Yet, thus far little private investment has gone to renewable energy projects in the region (aside from South Africa). The reasons for this lack of interest from the private sector in power sector investments is multifaceted, but can be boiled down to the factors outlined in the next section.

3.1 High (Perceived) Political Risks

With the exception of a few key markets in sub-Saharan Africa (including Namibia), most countries in the region suffer from high (perceived) political risk that prevents private investors and specifically banks from entering. Political risk insurance (PRI) is available for many countries and sectors (including from multilateral organisations such as the Multilateral Investment Guarantee Agency, MIGA), albeit on a limited scale and associated with high premiums that can undermine the bankability of individual transactions. Much has improved on the African continent during the past decade, and some countries have been able to attract significant private investment on the back of an improved investment climate and enhanced political stability. However, reputations tend to be sticky and thus political risk will remain as a key hurdle, especially for power investments that require long-term investor commitments.

3.2 Doubts Regarding the Creditworthiness of Off-takers in the Region (High Commercial Risks)

With the exception of a few key markets, countries in sub-Saharan Africa lack creditworthy off-takers that meet the stringent requirements of developers and their banks. Not cost-reflective tariff regimes in many countries mean that the balance sheet of off-takers is frequently weak, raising concerns among investors and banks that they may not be able to meet long-term payment obligations under power purchase agreements (PPAs). While the actual incidence of non-payment or default under PPAs in Africa has been rather low, the concern is a real one, specifically in light of the political-economic trade-offs that are typically associated with tariff-setting in the individual countries. In addition, the very fact that many power markets offer US$ tariffs to IPPs also means that off-takers have to shoulder a rather significant currency exposure that is costly (and in some cases impossible) to hedge, putting the stability of their balance sheets further at risk.

3.3 Incomplete or Incoherent Sector Reforms

While many countries in sub-Saharan Africa have undertaken notable steps during the past decade to initiate sector reform and to open their power markets for private investments, these reform procedures tend to be far from uniform or complete. In some cases, a lack of experience and capacity has resulted in weak institutional regimes in the respective power sectors, making it difficult and costly for the private sector to engage. In other countries, unresolved political-economic conflicts surrounding efforts at (partial) unbundling and tariff-setting have resulted in incoherent policy regimes, which also undermine private investment.

3.4 Lack of Bankable Projects Due to Low Purchase Tariffs forRenewable Energy, Especially in REFiT Programmes

While many countries on the continent have started to experiment with renewable energy promotion initiatives such as renewable energy feed-in tariff programmes (REFiTs), many of these programmes do not provide for tariff levels that are sufficient to make renewable energy IPPs bankable. The South African experience demonstrates that competitive renewable energy procurement programmes can result in attractive tariff levels that are on par with alternative (fossil) generation options. However, few countries have a sufficiently large market to effectively run tenders such as the RE IPP Procurement Programme in South Africa. In some countries, international partners have provided financial assistance to support the introduction of REFiTs (including the GET FiT Programme in Uganda), and the decreasing levelised cost of many renewable energy tariffs (especially solar PV, but also wind) means that they will become more affordable going forward. They almost certainly are more cost-effective than emergency thermal generation.

3.5 No Bankable Standards for Power Purchase Agreements and Other Legal Documents Underlying Project Finance Transactions

Even in those countries where a conducive legal and regulatory regime is in place, a lack of a model contract structure for IPPs means that negotiations with IPPs are typically protracted and can extend over years, significantly raising risks and developer costs for investors.

3.6 Technical Challenges with Grid Integration of Renewables

As the experience in Germany and, more recently, in South Africa shows, the integration of renewable energy into transmission systems presents technical and financial challenges. The total system cost of promoting renewables must be considered appropriately. Transmission networks in many African countries are in dire need of rehabilitation and upgrading and few currently have the potential to absorb significant amounts of (variable) renewable energy.

All in all, and notwithstanding efforts on the part of various countries in the region to provide greater space for the private sector in their power sectors, thus far private sector investment falls far short of what is needed to make any significant dent in the development of power sectors in the region. Significantly, most ongoing private sector engagement is heavily focused on fossil fuel-based power generation projects that are characterised by (comparatively) high returns and short payback times.

4 The Situation in Namibia

Namibia's electricity sector is relatively small and has historically been characterised by strong dependence on South Africa. For many years, Namibia was supplied with very low-cost base-load electricity from South Africa. In 2006, South Africa discontinued these regular exports of base-load electricity owing to power shortages. In parallel, the demand for electricity in Namibia in recent years has increased significantly, mainly owing to the expansion of mining activities, as well as increased household connections.

Owing to its long-standing reliance on South Africa, Namibia has not implemented any significant greenfield generation investments in the last decades. Today, however, the Namibian government-owned power utility, NamPower, urgently has to increase investment in its own generating capacity. Indeed, owing to the expiration of various power supply contracts with Eskom, in combination with strong domestic demand growth, NamPower is likely to experience a prolonged period of curtailed supply starting in early 2016, which, if not managed well, may result in periodic loadshedding similar to the situation with which South African power customers are currently confronted.

The *Kreditanstalt für Wiederaufbau* (*KfW*) supports NamPower's power investment strategy by providing concessional loans as well as grant funding for strategic power investment projects. In recent years, two concessional loans were granted. In addition to co-financing the regional transmission line Caprivi Link (EUR35 million), KfW also provided funding for the rehabilitation and extension of the Ruacana hydro power plant (EUR35 million), Namibia's largest generation plant utilising the Kunene River at the border with Angola. More recently, NamPower has also developed the Short-Term-Critical-Supply Programme which includes measures to expand and optimise generation and to foster energy efficiency and demand-side management initiatives. These programmes are also financially supported by KfW. Furthermore, NamPower is pushing the development of the Kudu gas power plant (800 MW) forward, which is supposed to come on stream in 2019, although the recent exit of Tullow Oil as the main upstream partner in the development of the offshore gasfield raises significant doubts about the timeline for the project, as well as its overall economic viability. In parallel, NamPower has also initiated a process to procure 250 MW of emergency power (possibly a liquified natural gas plant) in order to ensure the utility can plug any short- term supply gaps in the years until Kudu is connected to the grid. On the renewable energy front, NamPower (with support from KfW and other development financiers, such as the European Investment Bank) has taken steps to explore the viability of concentrated solar power and biomass (especially based on invader bush), including the procurement of experts and feasibility studies.

The government of Namibia has also taken steps in recent years to open the national power market for IPPs to leverage private investment into the space, and to augment NamPower's efforts to ensure security of supply. Already starting in the late 1990s, the government of Namibia advanced key sector reforms to allow for private investment in power projects. Various reform acts – including the Electricity Acts of 2000 and 2007 – have further paved the way for private investment in generation. Overall, the government has started to create an investment environment that is conducive to IPPs by legislating for regulation, non-discriminatory access to the transmission system, and the implementation of a modified single buyer model. In addition, as a result of prudent management and a reasonable tariff policy, NamPower is considered as one of the most reliable and creditworthy off-takers on the continent.

Considering these steps, Namibia compares quite favourably to most other countries in sub-Saharan Africa, where legal and regulatory reform are not as advanced and well-developed with regard to the entry of IPPs. As a consequence, Namibia has attracted interest from a large number of national and international project developers that have invested time and funds to develop new generation projects. Indeed, the Namibian regulator, the Electricity Control Board (ECB) has reportedly issued a number of licences to prospective IPPs in recent years. A significant portion of the developer activity has been registered on the renewable energy front, where numerous investors have explored the potential especially for solar PV and wind power plants. NamPower implemented an auction for solar PV for 30 MW of capacity in an approach that mirrors the South African Renewable Energy IPP Procurement Programme. That tender has registered strong interest from the private developer community, especially from firms that are also active in the South African renewable energy space. In addition, the ECB, in collaboration with other sector stakeholders, is working on the development of a renewable energy feed-in tariff policy (REFiT) to promote small-scale on-grid renewable power generation. A review of the draft REFiT reveals a well-structured programme with decent tariff levels that should be attractive to the private sector.

Yet, the fact remains that, thus far, not a single IPP has gone to financial close in Namibia, resulting in much frustration in the investor community and presenting a lost opportunity for the country, as it threatens to slip into an extended period of undersupply of electricity. The main issue that impedes IPPs from reaching financial close at this stage is lack of adequate government support through issuance of an implementation (or government) support agreement that meets basic market standards. The key sticking point in the negotiations between the government and IPPs appears to be a lack of agreement on risk allocation, especially as it pertains to government risk (risk of expropriation, risk of civil war, changes in law, etc.). The government of Namibia appears unwilling to assume these risks, arguing that these are risks private investors should be willing and able to assume. However, private developers – and notably the banks that are supposed to provide credit for these projects – argue that these are risks outside their control that cannot be managed effectively by the private sector in a project finance setting.

While Namibia has been economically and politically stable for many years, experience of developing first in-country IPPs in power sectors of other jurisdictions in sub- Saharan Africa indicates that the government needs to provide more support to IPPs if they are to be project financed by commercial banks and other financial institutions, including development finance institutions (DFIs). Indeed, all across the continent – including in South Africa – governments have assumed sovereign risks as part of the transaction documentation for the specific power projects. With specific reference to standard change in law protection, it is also important to point out that, in contrast, for example, to the upstream oil industry, power is (or should be), a low risk and low return industry. The situation and economics facing an upstream oil or gas company are extremely different to that of a commercial bank or DFI lender considering whether or not to lend to an IPP. Oil and gas industry financiers have a practical comfort in that their product (oil or gas) is immediately saleable for US$ to any number of buyers in international markets, and the host government has a large financial stake (through its share of revenue received via the production sharing agreement) to see that the product gets to market and is sold. Again this is materially different to the reality of electricity.

Clearly, no government is particularly keen to provide such protections for investors. It is understandable that sovereigns should try to 'push the envelope' on risk allocation with the private sector as much as they possibly can to extract the best deal for the country – that is indeed what they are expected to do. However, the costs and benefits of such an approach need to be carefully considered. In the Namibian case, a restrictive approach has thus far meant that the private sector does not invest in the country's power sector, with detrimental impacts for consumers and the economy as a whole.

5 Conclusion

As power demand further increases, pressure on the Namibian government and NamPower to bring more generation into the grid and to consumers will rise significantly in the months and years ahead. As noted earlier, whether NamPower will be able to bring the Kudu Gas-to-Power Project online in the foreseeable future is an open question. If constructed on time, the 250 MW thermal emergency power plant that NamPower is currently procuring will take some pressure off the system, but will most likely come with a significant price tag. Typically, based on regional experience, the levelised cost of power from emergency plants of this nature exceeds US$c20/ kWh, significantly higher than alternative renewable energy options. The opportunity cost of not getting the various shovel-ready renewable energy generation projects into the grid is thus rising.

If and when this challenge has been addressed, there is good reason to believe that Namibia will see quite substantial IPP investment, especially in the renewable energy space. This could play a major role in addressing the country's looming supply crisis, as well as in ensuring long-term energy independence through the reliance on indigenous energy resources. Existing approaches – including the solar PV tender spearheaded by NamPower as well as the REFiT that is still under development – can unfold their full potential. To that end, it would be important also to profit from the lessons other countries in the region have learned with regard to the implementation of renewable energy promotion programmes. Specifically, there is growing evidence that for some technologies (especially solar PV, but to some extent also wind) a REFiT may not be the most efficient approach to foster private investment even in smaller-scale renewables. Experience from the Renewable Energy IPP Procurement Programme in South Africa but also the GET FiT Solar Tender in Uganda would suggest that a competitive tendering approach may yield more efficient results (in terms of lower tariffs). An intelligent REFiT system for smaller-scale renewable energy may still play a very useful role in Namibia, however.

In addition, it would be useful to explore the potential for Namibia to partner with South Africa in tendering renewable energy capacity. The Renewable Energy IPP Procurement Programme in South Africa operates at a scale (thus far, close to 4 000 MW in capacity have been allocated and successfully placed in the market) that Namibia, owing to the small size of its market, could never achieve. Considering that the Namibian dollar and the South African rand are pegged, it is conceivable that Namibia could join the South African Renewable Energy IPP Procurement Programme to benefit from its economies of scale in purchasing capacity. Additional benefits would be derived from the fact that the significant transaction costs typically associated with the implementation of renewable energy tenders could be reduced. DFIs such as KfW stand ready to work with the government of Namibia to support private investment in renewable energy.

12.
FOREIGN DIRECT INVESTMENT PROTECTION FOR IMPROVED ENERGY SECURITY IN SOUTHERN AFRICA: THE EXAMPLES OF SADC AND NAMIBIA

Oliver C. Ruppel & Frieda Shifotoka

1 Introduction

Affordable energy services are not only an important factor for achieving the Millennium Development Goals. In fact, energy is essential for alleviating poverty, and improving human welfare and the standard of living.

Energy security can be defined as the sufficiency of resources to meet national energy demand at competitive and stable prices, and the resilience of the energy supply. Energy security must be viewed in the wider context of human security,[1] which rests on two pillars. The first, the 'freedom from fear' factor, focuses on protecting individuals; and the second, the 'freedom from want' factor, which emphasises the satisfying of the individual's basic needs.[2] Energy security is thus closely related to the energy access challenge, namely to ensure that distributive impacts of energy costs do not burden or exclude, for instance, low-income households. This in turn largely depends on an effective energy policy, the removal of financial barriers, the development of a solid legal framework and sufficient regulatory stability.

Foreign direct investment (FDI) protection plays a significant role in improved energy security in sub-Saharan Africa. Improving the investment climate can have enormous positive consequences. Various factors, including poor governance, institutional failures, macroeconomic policy imperfections and inadequate infrastructure, as well as rampant corruption, bureaucratic red tape, a weak legal systems and a lack of transparency in government departments, all lead to an unfavourable investment climate. The World Bank's *Doing Business* report is one of the instruments that can be used to rank the favourability of a state's business climate. It ranks economies on the basis of nine parameters – starting a business; dealing with construction permits;

1 Ruppel & Van Wyk (2013:799–826).
2 Kumssa & Jones (2010:453–461).

registering property; getting credit; protecting investors; paying taxes; trading across borders; enforcing contracts; and closing a business. In the past five years, about 85% of the world's economies have made it easier for local entrepreneurs to operate by improving business regulation. The rankings for 185 countries in 2012, however, reveal that of the 33 countries classified as low-income economies only two fall within the rankings from 50 to 100. Of these 33 low-income countries, 17 rank among the last 50 of the 185 countries. Of the 50 lowest-ranking countries, 32 are in Africa, which is the continent most vulnerable to the effects of climate change. When comparing the World Bank's African Ease of Doing Business rankings of 2011 with the previous year, one can see that 10 African countries were ranked the same as in 2010, 24 were downgraded, and 17 obtained a higher rank as a result of policy reforms and initiatives that had a positive impact on the investment climate. These figures correspond with those on foreign direct investment (FDI) in Africa, contained in the *World Investment* report of the UN Conference on Trade and Development.

In order to improve the level of energy security and to attract foreign capital and mobilise adequate and sustained levels of domestic private investment, countries in Southern Africa may still need to achieve higher levels of investment.

> Africa is desperately short of investment, both from locals and international investors: an extra US$ 90 billion a year is needed for infrastructure, never mind other businesses. This is throttling development. Infrastructure bottlenecks alone are thought to cut growth in sub-Saharan Africa by two percentage points a year. But many of the normal routes by which capital gets into economies are blocked in Africa.[3]

Investment barriers therefore need to be reduced with regard to political and/or regulatory instabilities. These barriers include political instability, insecurity of property rights, lack of knowledge of legal systems, currency risks and the instability and uncertainty of the regulatory and policy environment, including, for example, the longevity of incentive programmes.

Mobilising investment for improved energy security and sustainable development requires political commitment to overcome substantial barriers at various levels. To enable new markets for improved energy security and sustainable development, governments require adequate regulatory frameworks (international, regional and national) in order to give investors the necessary confidence. The national state has to balance the interest of attracting (and securing) international investment while promoting peace and security for its population. The most appropriate approach for achieving both of the aforementioned is adherence to and promotion of the rule of law, while creating incentive structures for investors to act sustainably and to respect national social development goals, empowerment policies, labour standards and human rights.

3 Cf. *The Economist* (2015).

2 Foreign Direct Investment Protection

Foreign direct investment (FDI) usually involves the transfer of tangible, or intangible, assets from one country to another, for the purpose of using them, in the latter country, to generate wealth while under the total, or partial, control of the asset owner.[44] Four conditions that have to be present, according to the International Centre for the Settlement of Investment Disputes (ICSID), for an activity to constitute an investment are: a contribution of money, or asset of economic value; a certain duration; an element of risk; and a contribution to the host state's development.[5] However, different agreements contain different definitions of what activities can be considered as an investment.Of the different forms of foreign investment, the most common forms are FDI, portfolio investment, joint venture, and production-sharing investment. The Organisation for Economic Co-operation and Development (OECD) defines FDI as:

> The objective of establishing a lasting interest by a resident enterprise in one economy in an enterprise that is resident in an economy other than that of the direct investor.[6]

The lasting interest that is referred to above implies that a long-term relationship should be in existence between the enterprise in one country, and a resident in an economy other than that of the direct investor.[7] The resident with the interest in investing is the direct investor, while the enterprise that is referred to in the above definition is the direct investment enterprise that is situated in the host state.[8] FDI is one of the common forms of investment that foreign investors use when investing in another country.

Foreign investments can have a positive impact on the economy of a state in terms of the development involved, which can affect the trade, and other, sectors in different ways. The benefits that can result for the territory of the host state can take various forms, such as the provision of employment opportunities, the importing of money into the region, and the exploring of natural resources with technologically advanced machinery that the host state itself might not have at its disposal. Since foreign investments benefit the host state, the government concerned should make sure that it has in place the right standard of protection that is required by international law, and simultaneously accord foreign investors an opportunity to make use of such laws when rights are violated. Doing so would not only secure the investments of foreign investors in the host state, but would also increase the likelihood of attracting foreign investors in the future, thus serving as a related draw card. Hence, the host state should treat foreign investors in accordance with both the national, and the international, rules and principles.[9] In doing so, the host state should try to maintain a balance between protecting foreign investors, and protecting its own interests, such as the local market,

4 Sornarajah (2010).
5 Salini test, *Salini Construtorri S.p.A and Italstrade S.p.A v Morocco ICSID ARB/00/4.*
6 OECD (2008:48).
7 Duce & de España (2003:2).
8 (ibid.).
9 Utz (2009:17).

the local investors, and the immediate environment.

Although there is no specific international legal framework governing international investment law, there are various ways in which foreign investors can be protected. The sources of international law, in terms of Article 38 (2) of the Statute of the International Court of Justice (ICJ), are applicable to international foreign investment law and they can be used to protect foreign investors and their investments. In addition, some ways of treating, and protecting, foreign investors have become part of customary international law over time, with various institutions, such as the World Bank Group, devising guidelines for the treatment of foreign investors.[10] Although other sources of international law, such as the principles which, *inter alia,* include state responsibility, diplomatic protection, and the minimum standard for the treatment of aliens, can also be used to protect foreign investors, the focus here is on the treaty protection as a source of international law.

3 International Investment Agreements

International investment agreements can take either the form of bilateral investment treaties (BITs) or of multilateral investment agreements (MIAs). MIAs refer to investment agreements that are entered into by more than two states. BITs came about as agreed-upon sets of rules between the signatory states, which were intended to clarify the legal standards that would regulate the foreign investments made between them, based on the presumption that the host state's domestic legal system might not provide sufficient protection for the investment.[11] BITs can, hence, be seen as agreements between two states, and they are often compared to MIAs. BITs tend to establish an equal legal relation between the two signatory states concerned, since it is within the contemplation of their provisions that either party may invest, under the same conditions, in the other's territory. BITs, which allow states to make specific commitments to each other, depending on the investments involved, are often reciprocal in nature, with the same standards applying to both states concerned. As a result, BITs are often concluded in preference to MIAs.

A BIT is intended to determine, and to protect, the rights and obligations of foreign investors from the states that are party to the agreement.[12] The protection concerned is accorded to the nationals of the member states, including both natural persons and legal persons, such as corporations and companies. With regard to legal persons, nationality can be determined in terms of the place of incorporation, in terms of the seat or in terms of the nature of control that is exerted by the nationals of a state that is party to the BIT.[13] The objectives of BITs can, *inter alia,* be: to promote the effective utilisation of economic resources; to promote, and protect, investments; to improve living standards; to stimulate the flow of capital and technology; to increase the amount of economic development of

10 Sanford & Weiss (2004).
11 Dolzer (2007).
12 Qureshi & Ziegler (2007:498).
13 (ibid.:500).

the contracting parties; and to heighten the amount of economic cooperation between the two countries.[14] According to the UN Resolution on Permanent Sovereignty over Natural Resources (1962), foreign investment agreements that are freely entered into by sovereign states should be observed in good faith. This is because, once they are entered into, investment agreements become part of the national law of a state, with the same legally binding effect that other national laws have. Thus, a BIT can be a legal basis for the making of claims by foreign investors, if there is an alleged violation of the provisions that are contained therein.

Although the contents of BITs differ, they usually contain provisions that guarantee some form of treatment of the foreign investors involved. BITs typically cover the following areas: the scope and definition of investment; admission and establishment; national treatment (NT); most-favoured-nation (MFN) treatment; fair and equitable treatment (FET); compensation in the event of expropriation or damage to the investment; guarantees of the free transfers of funds; and dispute settlement mechanisms.

4 Energy Security, Investor Protection and Regional Economic Communities: The Example of SADC

Due to the enormous fracking activities in northern America, the global oil price has been drastically on the decline. Nevertheless, the run for energy resources in sub-Saharan Africa continues as especially European countries will become more and more depended on energy resources from that region. South Africa (and others) could benefit from increased regional cooperation in countering its energy deficiencies.[15]

At the seventh ordinary session of the African Union's Assembly of Heads of State and Government in Banjul, The Gambia, in July 2006, the AU officially recognised eight regional economic communities (RECs).[16] Alphabetically listed, they are:[17]

- the Arab Maghreb Union (AMU);
- the Community of Sahel-Saharan States (CEN-SAD);
- the Common Market for Eastern and Southern Africa (COMESA);
- the East African Community (EAC);
- the Economic Community of Central African States (ECCAS);
- the Economic Community of West African States (ECOWAS);
- the Intergovernmental Authority on Development (IGAD); and
- the Southern African Development Community (SADC).

14 See BITs preambles, more specifically the Namibia-Spain and Namibia-Netherlands BITs.
15 Scholvin et al. (2015).
16 See AU (2006).
17 Ruppel (2009a:276).

All African Union member states are affiliated to one or more of these RECs. The Southern African Development Community (SADC) was established in 1992, in terms of the SADC Treaty. This regional economic community consists of Southern African countries that came together to form a corporation.[18] The objectives of the SADC include, *inter alia,* achieving development, regional integration, peace and security, and economic growth, so as to alleviate poverty, and to enhance the standard and quality of life of the people of Southern Africa.[19] The SADC Treaty as amended by the SADC Amendment Treaty is the constitutive document from which all subsequent instruments in SADC are derived. Ensuing legal instruments are the SADC protocols[20] and legally non-binding instruments such as memoranda of understanding,[21] other agreements,[22] charters[23] and pacts.[24]

In view of the heterogeneity of SADC member states in terms of surface area, population figures, size of the domestic markets, per capita incomes, the endowment with natural resources, the social and political situation, and also the variety of legal systems applied,[25] it is of increasing significance for SADC member states to harmonise the law by means of implementation and transformation of SADC protocols aiming to reduce or eliminate the differences between national and SADC community law.[262] In terms of SADC community law, the SADC Treaty is the highest source of law within SADC's legal framework. In its preamble, the SADC Treaty determines, *inter alia*, to ensure, through common action, the progress and well-being of the people of Southern Africa, and recognises the need to involve the people of the SADC region centrally in the process of development and integration. SADC envisages "(…) a common future, a future in a regional community that will ensure economic well-being, improvement of the standards of living and quality of life, freedom and social justice, and peace and security for the peoples of Southern Africa". This shared vision is anchored on

18 These countries are Namibia, Angola, Botswana, Zambia, Zimbabwe, South Africa, Lesotho, Swaziland, Mozambique, Madagascar, Malawi, Mauritius, Democratic Republic of Congo, Tanzania and Seychelles.

19 SADC Overview http://www.sadc.int/about-sadc/overview/, last accessed 22 December 2014.

20 SADC protocols are legal instruments of implementation of the SADC Treaty and it is required that two-thirds of member states ratify a protocol before it becomes legally binding.

21 A memorandum of understanding (MoU) is a preliminary legal document describing an agreement between parties.

22 An agreement is a less formal document dealing with a more specific subject, or narrower range of issues, than a protocol. It is generally used for outlining technical or administrative areas of cooperation.

23 A charter is a document incorporating an institution and specifying its rights, privileges and responsibilities. It usually includes the set of principles that form the constitution of the organisation.

24 A pact is similar to an agreement, although its contents are usually defence- or security-related.

25 See Ruppel-Schlichting & Ruppel (2011).

26 See Ruppel (2013:69ff.).

the common values and principles and the historical and cultural affinities that exist between the peoples of Southern Africa.[27]

Besides the aforementioned general provisions and objectives in the SADC Treaty, the SADC legal regime also constitutes the SADC protocols. The protocols are instruments by means of which the SADC Treaty is implemented, and they have the same legal force as the SADC Treaty itself.

> The SADC region has been experiencing a crippling power shortage that was first detected as early as 1999. This situation has forced most countries in the Southern African Development Community (SADC) to implement demand-side management policies such as load shedding that have to some extent succeeded in restraining overall electricity demand in the region. However, load shedding has also had a negative impact on companies by forcing them to scale down production due to limited electricity, thereby affecting socio-economic development. The SADC Energy Thematic Group (ETG) has entered discussions on the ongoing review of the Regional Indicative Strategic Development Plan (RISDP), looking at the current status, the role of the SADC Secretariat and the way forward. Infrastructure development, including in the energy sector, is one of the top priorities to be pursued under the revised RISDP. The Revised RISDP, which is in the final stages of preparation identifies several main priorities to be pursued by the region from 2015-2020. Priority A seeks to promote industrial development and market integration through, among other things, strengthening the productive competitiveness and supply side capacity of member states as well as improving movement of goods and facilitating financial market integration and monetary cooperation. Priority B is on provision and improvement of infrastructure support for regional integration. Energy is a critical area of this pillar of the Revised RISDP and considerable preparatory work has been done in this area to develop enabling policies, systems and processes that will greatly facilitate project preparation as well as help to attract private sector investments and further promote public-private partnerships. Moreover, the envisaged SADC Renewable Energy Strategy and Action Plan 2015 to 2020 (RESAP I) aims to encourage the region to achieve a renewable energy mix of at least 32 percent by 2020, which should rise to 35 percent by 2030. Currently, SADC generates about 74 percent of its electricity from coal thermal stations. Renewable energy sources, which are in abundance across the region, are not yet considered as major contributors to the region's electricity needs, save for hydropower that accounts for about 20 percent of SADC's total energy generation. The proposed establishment of the SADC Centre for Renewable Energy and Energy Efficiency (SACREEE) could increase the uptake of clean energy in southern Africa, enabling the region to address its energy challenges. (...) According to the African Development Bank, the SADC region has the potential to become a "gold mine" for renewable energy due to the abundant solar and wind resources that are now hugely sought after by international investors in their quest for clean energy.[28]

Energy is vital to development in the SADC. Beyond its use in daily life, fuel and electricity catalyse infrastructure projects that drive both regional integration and economic growth. Recognising the fundamental role of energy in accomplishing its goals, the SADC passed the Protocol on Energy in 1996, which provides a framework

27 For SADC's vision, see http://www.sadc.int/, last accessed 22 December 2014.
28 *The Villager* (2015).

for cooperation on energy policy among SADC member states. Since the adoption of the Protocol on Energy, the SADC has enacted several strategic plans for energy development in the region: the SADC Energy Cooperation Policy and Strategy in 1996, the SADC Energy Action Plan in 1997, the SADC Energy Activity Plan in 2000, and most recently the Regional Infrastructure Development Master Plan and its Energy Sector Plan in 2012. These development strategies set out tangible objectives for SADC and its member states for infrastructure development in energy and its subsectors of fuelwood, petroleum and natural gas, electricity, coal, renewable energy, and energy efficiency and conservation. Although implementation of these strategies has been slow, the region has made significant strides, particularly in electricity. At present, nine member states of SADC have merged their electricity grids into the Southern African Power Pool, reducing costs and creating a competitive common market for electricity in the region. Similarly, SADC has established the Regional Electricity Regulatory Association, which has helped in harmonising the region's regulatory policies on energy and its subsectors. While SADC is enacting a number of initiatives to address these issues, it has identified two chief points of focus, namely:

- electricity generation – Southern Africa has ample resources for electricity generation, though it occasionally lacks the capacity for development; and
- hydropower and renewable energy – Renewable energy has grown in importance for both regional and global energy markets.[29]

Both of the aforementioned points of focus require significant foreign investment for their successful implementation. Many countries in Southern Africa have understood the necessity of improving their image and of offering increased incentive-oriented and institutional support structures to foreign investors. The furtherance of economic development, regional integration, and the reduction of poverty inevitably go hand in hand with energy security and foreign direct investment protection.[30] Although this interrelationship has become more apparent over the past few years, many regional integration processes still face obstacles and challenges.[31] The fear of losing state autonomy, the fear of losing national identity, socioeconomic disparity among members, historical disagreement, lack of vision, and unwillingness to share resources are some of the obstacles that present themselves with regard to regional integration. Regional integration provides a tool to maintain political stability by building trust, enhancing understanding between groups and deepening interdependence.[32] At the same time, the triumph of market mechanisms has accelerated the process of globalisation. After the collapse of the competition between market-driven and state-commanded economies, developing countries seem to have only one option to follow for modernisation and

29 Cf. http://www.sadc.int/themes/infrastructure/en/, last accessed 22 December 2014.

30 This section is largely based on Ruppel & Ruppel-Schlichting (2012:32–71).

31 See Ruppel (2009a:273–347).

32 Ruppel & Ruppel-Schlichting (2012:41).

development. The same applies to the question regarding the relation between market, development and well-being, and the influence economic development can play on the alleviation of poverty in view of the fact that economic development is not always concomitant with greater welfare of the average individual, as the growth of the gross national product (GNP) is not a sufficient indicator with which to measure the level of security and the quality of life of people.[33] Energy security also plays a significant role in that regard and not only can RECs promote foreign direct investment to jumpstart related developmental cooperative processes among the member countries and the rest of the world,[34] but they can also be another means of protecting foreign investors. Although the agreements in question may not be entered into entirely for the protection of the foreign investors concerned, as with BITs and MIAs or with the investment laws that are found to be in place in the territories of the host state, they nevertheless do offer such protection to foreign investors and to their investments. As investment can contribute both directly, and indirectly, to development, as well as create employment opportunities for people in the host state, the SADC included the issue of investment on its agendas. As a result, the SADC Protocol on Finance and Investment and the SADC Model BIT Template, which is a guide for member states negotiating BITs, were drawn up. In addition, there is, of course, a link between foreign investment and trade. Relevant Protocols are the 1996 SADC Protocol on Trade and the 2012 SADC Protocol on Trade in Services.[35]

In 2006, SADC adopted a Protocol on Finance and Investment. Annex II of the Protocol relates to cooperation on investment, which is relevant to foreign investment. The Protocol recognises the link between trade and investment in its Preamble, and reaffirms that investment increases economic growth and sustainable development. Article 2(1) requires the host state to admit foreign investors to its territories, in accordance with the host state's laws and regulations. This is an obligation that the host state takes on before foreign investors start operating their businesses there. The right to be treated in terms of the FET, and to MFN treatment and protection from expropriation and nationalisation are reflected in the Protocol.[36] With regard to expropriation, the same standards of prompt, adequate, and effective compensation are followed in the Protocol. Article 26 of the Protocol allows state parties to conclude BITs with third states. The host state has to make sure that the foreign investors have access to courts or tribunals that are present in its territory. Thus, it first requires investors to exhaust local remedies before taking a dispute to international arbitration. The Protocol provides for disputes to be resolved

33 Ruppel (2009a:273–347).

34 Ruppel (2010a:125).

35 Ruppel & Ruppel-Schlichting (2011:50).

36 Article 6(1) of the SADC Protocol on Finance and Investment provides for the investors and their investments to enjoy the FET; Article 6(2) provides investors and their investments to be no less favourable than investors from third states; and Article 5 protects investments from expropriation or nationalisation unless done for a public purpose, under due process of law, on a non-discriminatory basis and subject to the payment of prompt, adequate and effective compensation.

under the SADC Tribunal, ICSID or in any *ad hoc* tribunal that is established under the UNCITRAL Arbitration Rules.[37] In addition, Article 21 of the Protocol encourages state parties to accede to the following conventions which are designed to protect, or to promote, investments: the New York Convention of 1958, the ICSID of 1965 and the Convention Establishing the Multilateral Investment Guarantee Agency (MIGA) of 1985.

In July 2012, the SADC Drafting Committee completed the SADC Model BIT as part of the goal of the SADC Protocol on Finance and Investment of harmonising the investment laws and policies of member states. The model BIT is not a legally binding document, but it is rather a guide that members of SADC can choose to use wholly, or partly, in negotiating, developing, and drafting their own BIT.[38] Therefore, each member is responsible for its own choice of clauses, and for the final result of any BIT negotiation. The Model BIT recommends the inclusion of provisions, and the admission and promotion of foreign investors. This relates to what the host state should do before admitting foreign investors to its territory, in terms of which admission should be done in good faith, and in accordance with the applicable laws of the host state. The principle of good faith reflects the notions of fairness, honesty, reasonableness, and honourable conduct.[39] This not only means that there should be laws on the admittance of foreign investors, but also that the laws should be applied in a fair and reasonable manner.

Rights that are to be accorded to foreign investors, after admission to the host state, are essential for BITs. The Drafting Committee recommended non-discrimination that incorporates the national treatment (NT) standard. Unlike other BITs, where it is often left to tribunals to interpret what “like circumstances” are, the Model BIT gives certainty on this issue, including factors that need to be examined in order to determine “like circumstances”. The factors include, *inter alia,* the sectors in which the investor is involved, the aim of the measure concerned, the effects on the local, regional or national environment and the effects on third persons and the local community.[40]

The Drafting Committee also decided to take a broad view on considering the treatment as being in “like circumstances”, rather than the narrow view of only considering whether the investors are treated in the same way. This facilitates interpretation, as the court, or tribunal, is then be able to ascertain the meaning, and the purpose, of the

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37 See Article 28(1) and (2). It should be noted, that the SADC Tribunal has been dissolved in 2010 and has not been operational since. In August 2015, the SADC Heads of State and Government approved a resolution on the establishment of the Southern African Development Community Administrative Tribunal (SADCAT). In contrast to the old SADC Tribunal, the revised Protocol regarding the SADCAT does not provide for access to the tribunal for individuals, and it will no longer handle cases between countries. The new SADCAT is thus no court of justice as the SADC Tribunal used to be but will merely function as a legal institution for the interpretation of treaties and protocols of SADC.

38 SADC (2012:3).

39 Mitchell (2006:341).

40 See Article 4.2 and its commentary in the SADC BIT Model Template.

principle. The exceptions to the standard include a list of sectors, or activities, to be set out in the schedule of the BIT, to which the standard does not apply. Such sectors would for example, be the sectors in which only local investors are allowed to invest, and from which foreign investors are excluded. The list in question is similar to the negative list used in BITs falling under international investment law. Secondly, non-conforming measures existing at the date of entry into force of the BIT under a state party's laws and regulations, or any amendment, or modification, made to such measures, can be allowed. This is provided that the measures in question do not decrease the level of conformity, as it existed immediately before the amendment, or modification.[41] This approach caters for both the existing laws, and for future amendments to the existing laws in the host state, provided that the future amendments are not more discriminatory in nature than the existing legislation.[42] An example, in the case of South Africa, is the existing law on black economic empowerment, or on affirmative action, which may discriminate against a foreign investor.

Thirdly, concessions, exemptions, or advantages resulting from BITs entered into before the BIT in question, and regional, or multilateral, agreements relating to the investment, or to the economic integration, can also be excluded from the application of the non-discrimination standard.[43] What is important for both these exceptions, is to set out such measures in a schedule to the BIT, in order to promote transparency. The Drafting Committee has recommended against including the MFN provision, with the aim of preventing the establishment of multilateral systems thereby. This is because the nature of the MFN provision allows foreign investors to benefit from the privileges that are accorded to foreign investors from third country states that are members of a regional, or international, agreement. In addition, the Drafting Committee is of the view that the broad interpretation of the MFN standard by various arbitrations makes it unpredictable in practice, resulting in unnecessary risks especially for the developing countries.

The Drafting Committee also recommended against the inclusion of the FET provision in BITs, because of the broad interpretation of arbitral decisions, resulting in it being seen as a highly controversial provision. As a result, the Committee recommended two options from which members can choose. Option one is for the members who, despite the recommendation of the Drafting Committee, wish to include the FET provision as it is known under international law.[44] Option two, in contrast, relates to the fair administrative treatment that differs from that pertaining to BITs under international law. The standard requires an administrative, legislative, and judicial process not to be arbitrary, as well as not to deny administrative and procedural justice to foreign investors and their investments. In addition, investors are to be informed in time when there are administrative or judicial proceedings affecting their investments; they should be given an opportunity to appeal administrative decisions; and they should have access to

41 See Article 4.3(a) of the SADC Model BIT Template.
42 See Commentary to Article 4.3(a) of the SADC Model BIT Template.
43 See Article 4.4 of the SADC Model BIT Template.
44 See Commentary to Article 5 of the SADC Model BIT Template.

government-held information.[45] All of the provisions above are aimed at improving the transparency, the efficiency, the accountability, and the independence of the regulatory, legislative, administrative, and judicial processes in the host states.

The provision on expropriation is similar to that in most BITs, with one exception, namely that the condition that expropriation must be non-discriminatory is removed under the Model BIT.[46] The Drafting Committee recommends that the principle of non-discrimination, in relation to expropriation, be tied to the same principle in the treaty with regard to the NT and for there not to be a stand-alone obligation in regard to expropriation. Measures that are not considered as unfair expropriation include the issuance, the revocation, the limitation, and the creation of compulsory licences that are granted in respect of intellectual property rights, provided that they are consistent with the provisions of international agreements in relation to intellectual property.[47] In this regard, the SADC Drafting Committee considered specifically the protection of medicines as an issue of concern for which the developing states have fought hard to secure intellectual property rights (IPR) limitations.[48]

The Model BIT also differs from other BITs in relation to determining the amount for compensation. It recommends three options, unlike other BITs which only provide for the market value method.[49] The first option requires the assessment of compensation to be based on an equitable balance between public interest and the interest of those affected. The second option, in contrast, requires an assessment to be made in relation to the fair market value of the expropriated investment, immediately before the expropriation takes place. In addition, there should be a balance between public interest and the interest of those affected. The third option, however, requires the use of only the fair market value method. The difference between the two last options is that, in terms of option two, there is a presumption that the fair market value will be used, but the state can rebut the presumption on the basis of the equitable criterion in order not to apply both the fair market and the equitable criterion when determining compensation. In contrast, under option three, the fair market value is the only basis for assessment. In simple terms, the first option considers the balance between public interest and the interest of foreign investors, whereas the second option considers both the interest, and the fair market value of the property, unless the state makes a rebuttal, with the third option considering only the fair market value.

45 The provision that requires the host state to inform foreign investors when there are administrative or judicial proceedings affecting their investments is in terms of customary international law and taken from the case of *Neer v Mexico*, *Opinion, 15 October 1926, 4 RIIA (1926) 60*. An exception to this rule is when informing foreign investors of such proceedings is against the existing laws of the host state.

46 See Commentary to Article 6.1 of the SADC Model BIT Template, SADC (2012).

47 This provision is also included in the NAFTA and COMESA agreements. See Commentary to Article 6.5 of the SADC Model BIT Template in this regard, SADC (2012).

48 See Commentary to Article 6.5 of the SADC Model BIT Template in this regard.

49 See Commentary to Article 6 of the SADC Model BIT Template.

If any of the requirements for expropriation are not followed in the process, the acquisition involved is regarded as being unlawful. This claim was made at the SADC Tribunal in the case of *Mike Campbell (Pvt) Ltd and Others v Republic of Zimbabwe* (2/2007) [2008] SADCT 2 (28 November 2008) at 21. In the case in question,[50] the applicants filed an application with the SADC Tribunal, challenging the compulsory acquisition of their agricultural lands by the Republic of Zimbabwe, which was carried out under section 16 B of the Zimbabwean Constitution, for the purpose of land reform. The section provided, among other measures, that all the agricultural land that was identified for the land reform programme should be acquired by and vested in the state, with no compensation being payable, and that no person so affected should be allowed to apply to the court to challenge the acquisition.

The applicants' arguments were that the government of Zimbabwe was in breach of the SADC Treaty when it enacted the amendment; they were denied access to court in order to challenge the acquisition; and they were denied compensation, and suffered racial discrimination. The Tribunal found that there had, indeed, been unlawful expropriation due to racial discrimination; that there had been no compensation; and that they had been denied access to the courts. Although, the Republic of Zimbabwe failed to abide by the decision of the Tribunal, and the Tribunal had also failed to take drastic measures against the Zimbabwean government for contravening its decision, the case reflects the non-tolerance of unlawful expropriation within SADC. Sadly, the SADC Tribunal is currently not operational, which consequently makes it impossible for aggrieved persons, such as investors, to obtain redress in terms of the Protocol of the SADC Tribunal. However, a Protocol on the Tribunal in the SADC was signed at the 34th SADC Summit held in Zimbabwe on 17 and 18 August 2014. This step has been taken to revive the SADC Tribunal. Although the Protocol is not yet publicly available, it is understood that the SADC Tribunal will no longer be able to adjudicate on cases brought by individuals, but only inter-state cases. If this is the case, individuals, including foreign investors, who have been aggrieved by their governments or host state are no longer able to seek redress under the SADC Tribunal.

Just as with non-discrimination, the host state should accord protection and security to foreign investors in a way that is no more favourable than that which it accords to the investments of third states. What differs in the right to protection and security, in terms of the SADC Model BIT, is the fact that such a right is provided for as a stand-alone provision, and it is not included in the FET standard, as it is practised in many BITs. The Drafting Committee is of the view that such a measure limits the potential for the granting of huge damage awards, because FET claims will be separate from the claims that are made in terms of the protection and security standard.

With regard to dispute settlement, the Drafting Committee prefers state-state dispute settlement, and it advises against the inclusion of the investor-state dispute settlement

50 For more information on the case and its outcomes, cf. Ruppel (2009a, b, c, d, 2011, 2012a, b, c); Ruppel & Bangamwabo (2008).

provision in a BIT. In terms of the former type of dispute settlement, a state is able to play two roles: by being a party to a dispute, through the claiming for damages, on behalf of an investor, for an alleged breach of a BIT; and by being party to a dispute that occurs directly between itself and the other state party. In the case of either dispute, undergoing processes of consultation, negotiation, and mediation is first recommended in an attempt to resolve the dispute, before a decision to seek arbitration is made. The Model BIT requires, firstly, the exhaustion of local remedies by the investor. This means that an investor must be given an opportunity to approach the local courts first, before approaching a regional or international court or tribunal.[51]

Therefore, before any claim can be taken under a dispute settlement mechanism set out under a BIT, the investor must first have sought recourse by means of a dispute settlement mechanism that is available in the host state. However, the clause on exhausting local remedies also allows a claim-seeking state to claim to argue that no local remedies are available in the host state, provided that the evidence is shown of such a lack. If this is done, the claimant will be entitled to approach an international settlement body directly, without first having to exhaust the local remedies. An example occurred in the case of *Mike Campbell (Pvt) Ltd and Others v Republic of Zimbabwe*, where the SADC Tribunal stated that, where the municipal law offers no remedy, or where the remedy that is offered is ineffective, the individual is not required to exhaust the local remedies.[52] In the aforementioned case, an application was first made to the High Court of Zimbabwe, which declared that the acquisitions of white farms were invalid.[53] However, after the amendment to the Constitution which allowed the government to expropriate farms without compensation came into operation, Campbell attempted to oppose his eviction from the farm by instituting proceedings in the Supreme Court of Zimbabwe in 2006. Since the Supreme Court did not rule on the matter within a reasonable time, the applicants approached the SADC Tribunal and the issue of non-exhaustion of local remedies was raised before the Tribunal.[54] As the relief sought at the Tribunal was similar to the one sought from the Supreme Court of Zimbabwe, the respondent argued that the applicants had not exhausted local remedies in terms of the SADC Protocol. The Tribunal held that the issue of failure to exhaust local remedies by the applicants was not relevant in the interim relief. It, however, stated that the amendment to the Constitution ousted the jurisdiction of the domestic courts in Zimbabwe since it prevented the challenge of the acquisition of land by the Zimbabwean government. With regard to the applicable law, the Drafting Committee recommends using the ICSID rules and the UNCITRAL arbitration rules.

Regional agreements are a form of protection that can be offered to foreign investors. SADC is a regional corporation that recognises the importance of investment, and

51 D'Ascoli & Scherr (2007:7).

52 *Mike Campbell (Pvt) Ltd & Others v Republic of Zimbabwe* (2/2007) [2008] SADCT 2 (28 November 2008), 20.

53 Ruppel (2012a:166).

54 (ibid.).

this is reflected in its protocols and Model BIT. SADC has taken a different approach to investment protection from that which is traditionally provided under customary international law. This is evident in the SADC Model BIT Template, which differs from a vast number of BITs and MIAs, as known under customary international law. The most notable difference relates to non-discrimination, in the exclusion of the MFN provision, and in expressly stating the nature of "like circumstances". In addition, the exceptions to non-discrimination are to be included as an annexure to the BIT. As the FET was also to be excluded, the Drafting Committee drafted another provision, which, in this regard, related to administrative fairness. Expropriation requirements are the same as those usually included under BITs, although the non-discriminatory requirement has been done away with, and there are three options for compensation. The Model BIT balances between protecting foreign investors and protecting the interests of host states, especially in terms of the developing states. This is manifested in the inclusion of a provision that protects IPRs.

5 Energy Security, Investor Protection and Domestic Law: The Example of Namibia

The 1998 White Paper on Energy Policy of Namibia focuses on meeting various energy goals towards achieving improved energy security, such as effective governance, security of supply, social upliftment, investment and growth, economic competitiveness, economic efficiency, and sustainability.[55]

Namibia's Vision 2030, launched in 2004 and aiming to provide long-term policy scenarios on the future course of development in the country at different points in time until 2030, sets out the objective to achieve security of energy supply through an appropriate diversity of economically competitive and reliable sources, to ensure that households and communities have access to affordable and appropriate energy supplies; and to establish an efficient energy sector that makes contributions to Namibia's economic competitiveness. Vision 2030 defines as one of its strategies the promotion of renewable energy sources and the implementation of projects for production from these sources to meet industry demand.[56] Vision 2030 formulates an target of 10.2% investment growth by 2030.[57]

The sequential National Development Plans (NDPs) as vehicles for achieving the long-term objectives have addressed the issue of energy security throughout. With regard to investment, the fourth National Development Plan (NDP4) for the period 2012/2013 – 2016/2017 acknowledges that investment "is a key driver of sustainable economic development, and experience from successful emerging economies highlights the importance of a high rate of investment to achieve long-term growth." NDP4 considers

55 Cf. Renkhoff (2013).
56 See GRN (2004:87).
57 (ibid.:63).

current investment levels to be insufficient to support higher economic growth[58] and has identified "making Namibia the preferred investment location in Africa"[59] as one of the foundation issues without which other efforts are not likely to succeed. A review of perfomance under the NDP3 (period from 2007/2008 to 2011/2012) has concluded that

> Private investment, including foreign direct investment, was targeted at N$50.3 billion, although actual investment was N$43.7 billion. Private savings in Namibia were substantially higher than private investment over the NDP3 period. Therefore it appears that the reason for below target investment is not a lack of investable funds, but rather a lack of mechanism to channel such funds to domestic investments. This suggests that more needs to be done not only to encourage private sector investment, but also to ensure Government efforts facilitate this. Government investment, including State-owned enterprises (SOEs), was close to the N$20 billion target at N$19 billion. However, of concern was the rate of Government savings, which decreased from around 8% of GDP at the start of the NDP3 cycle to an estimated -2% by 2011/12. In order for public investment to remain sustainable, public savings need to increase over the NDP4 cycle.[60]

Taking that an average of 3.6% annual economic growth (GDP) was achieved over the NDP3 period, the outlook in terms of the NDP4 sets an ambitious target of an average of 6% annual growth over the NDP4 period. According to NDP4, the prioritisation of investments into power generation is one of the keys to reaching this target.[61] To this end, NDP emphasises the urgent requirement for investment:

> For the NDP4 goals to be realized fully, there is a need to make a substantial invest-ment in the economy. Based on the currently available data, the investment re-quirement is estimated at N$187 billion. Given the size of the required investment, the Government's investment strategy will be guided by the principle of a Govern-ment-led economic development, combined with the need to maintain the neces-sary macro-economic stability. The Government will therefore undertake the re-quired investment in partnership with the private sector, where a mutually benefi-cial public-private-partnership investment program will be considered and imple-mented.[62]

A foreign investor may decide to invest in Namibia because of, *inter alia,* the liberal investment incentive regime, the sound financial system, the stable foreign exchange reserves, the friendly legal and regulatory framework, and its membership in international agreements. In addition, in 2013, the World Bank ranked Namibia 98th out of 189 countries in the world in terms of doing business, and 80th in terms of protecting foreign investors,[63] while it was ranked eighth out of 47 countries in terms of doing business in sub-Saharan Africa, and 12th in investor protection. As a result, Namibia has attracted many foreign investors. As foreign investment is important in Namibia, Article 99 of the

58 GRN (2012:xvi).
59 (ibid.:vi).
60 (ibid.:16).
61 (ibid.:20).
62 (ibid.:29).
63 International Finance Corporation (2013).

Constitution expressly provides for the encouragement of foreign investment, and for the establishment of an investment code. Pursuant to the Article mentioned above, the Foreign Investment Act was passed by parliament in 1990. Additionally, there is other national legislation and applicable international law in place, both important to foreign investors.

5.1 Foreign Investment Act 29 of 1990

The government of the Republic of Namibia is committed to stimulating economic growth and employment through attracting foreign investment. The Foreign Investment Act of 1990 is the primary legislation that governs foreign direct investment in Namibia. The Ministry of Trade and Industry (MTI) is the governmental authority which is primarily responsible for carrying out the provisions of the Foreign Investment Act.[64]

The Namibian Foreign Investment Act is currently under review.[65] On the admission and establishment of foreign investors, Namibia has regulations according to which the application and admission of investors is done at the Namibia Investment Centre (NIC), which is a unit under the Ministry of Trade and Industry that was established in terms of Section 2 of the Foreign Investment Act. A foreign investor is required to apply for a Certificate of Status Investment to the Minister of Trade and Industry. In making a decision, the Minister has to have regard for the extent of the investment, for whether the investment will contribute to Namibia's development objectives, for the impact, if any, that it is likely to have on the environment, and for the training and employment opportunities that the investment will create for Namibians.[66] In addition, the NIC is responsible for the attraction, the promotion, and the retention of foreign investors in Namibia. This helps both potential foreign investors, and those who are already operating in the country.

Section 3 of the Act relates to the business activities of foreign investors, and it prohibits discrimination against foreign investors, and their investments. Section 3(1) allows foreign investors to engage and to invest in any business activity that any Namibian may undertake. Section 3(2) requires the law governing the establishment, and the conduct of business activities, as well as the taxation of a foreign national, and any other aspects, not to be any different than that which applies for a Namibian. The two subsections relate to the NT standard, as they prohibit discrimination between foreign investors and domestic investors, and are similar to those that are contained in the BITs that are used under international law.

Sections 3(4) and 3(5) allow exceptions to the NT. Section 3(4) allows the Minister, by means of the publication of a notice in the *Government Gazette*, to specify any business, or category of business that, in the Minister's opinion, is engaged primarily in

64 Cf. US Department of State (2013).
65 MIT (2014).
66 Section 5(2) of the FIA.

the provision of services or in the production of goods that can be provided, or that can be adequately produced, by Namibians. Once this notice is published, foreign investors are not permitted to engage in the specified category of business concerned. Since such a prohibition is provided for in the Act, the making of the decision by the Minister does not discriminate against foreign investors in this regard. Notice 75 of *Government Gazette* No. 460 of 29 March 2010 is an example of such a ministerial action. In terms of this particular Notice, foreign nationals are prohibited from involving themselves in activities, including, *inter alia,* those pertaining to retail businesses, public transport services, hair salons, hair dressing and beauty treatments, unless a foreign national has received approval from the relevant Minister.

The case of *Walmart Stores Corp v The Chairperson of the Namibian Competition Board and three others* dealt with Section 3(4) of the Financial Intelligence Act (FIA), in an application for a merger, in terms of the Competition Act.[67] According to the Competition Commission, the merger required approval from the Minister of Trade, because it related to activities referred to in Section 3(4). The claim was that Walmart was becoming involved in retail business, which was indicated as being one of the business activities prohibited in terms of the above-mentioned Notice, unless, as was previously stated, approval to do so was granted by the Minister concerned. It was held that the Notice would not apply in the case in question, because Walmart would not be setting up a retail business, but it would merely be involved in a merger when it bought shares in Massmart, since it already had subsidiaries in Namibia. In addition, paragraph (a) of the Notice dealing with retail business was found to be invalid and unauthorised because the Minister had conferred upon himself powers that are not provided for in Section 3(4) of the FIA, as the latter merely prohibits foreign nationals from participating in the specified categories of business.

A second exception relates to any law with reference to natural resources, or any licence, or to other authorisation that is granted under such a law and which confers the rights for the exploitation of such resources.[68] In terms of the Act, such law may provide for the granting of such rights to, or for the enjoyment of such rights to or by, Namibians on terms that are more favourable than those that are applicable to foreign nationals. This provision was added to the existing legislation by means of the Foreign Investment Amendment Act 24 of 1993. The SADC Drafting Committee sought to avoid such preferential treatment when it included a provision on non-conforming measures existing on the date of entry into force of the BIT under a state party's laws and regulation, or any amendment or modification, to such measures. The provision was that the measures concerned would not decrease the degree of conformity required, as it existed immediately before the amendment, or modification, in terms of granting an exception to non-discrimination. In the absence of such a provision, foreign investors are at risk of being discriminated against because of the fear that the host state may

67 *Walmart Stores Corp v The Chairperson of the Namibian Competition Board and three Others* A 61/2011.

68 Section 3 (5).

amend laws to benefit the domestic investors alone. This section affects mostly foreign investors who started investing before 1993, when the Amendment came into operation. It can also be seen as a violation of the NT provision, since it was not included as an exception in the original 1990 Act.

Provisions on compensation are contained in Section 11 of the Act. However, the Act does not stipulate the requirements for expropriation, but rather refers to the Constitution. Article 16(2) reads as follows:

> The State or a competent body or organ authorised by law may expropriate property in the public interest, subject to the payment of just compensation, in accordance with requirements and procedures to be determined by an Act of Parliament.

The Article empowers the state, or any other competent body that is authorised by law, to expropriate property in the public interest, subject to the payment of compensation, and in accordance with procedures to be determined by an act of parliament.[69] Therefore, when the above requirements are followed, the expropriation that is performed in accordance with the Article is deemed to be lawful. As was stated earlier, what constitutes public interest is not defined under international law, and it is usually up to the domestic laws of each state to define the concept. In the Namibian context, the welfare, and interests, of farm workers on commercial agricultural farms reserved for expropriation was considered as one of the factors determining what constitutes "public interest".[70]

An act of parliament that was enacted, and which sets out the requirements, and the procedures on expropriation is the Agricultural Commercial Land Reform Act 6 of 1995. This Act governs, and sets out the procedures for, the expropriation of agricultural commercial land in Namibia. In terms of Section 11(2), just compensation should be given without undue delay when expropriation takes place. What needs to be taken into consideration when determining compensation is provided for in this particular Act. The factors to be taken into account are the Ministry's duty to investigate each farm and to determine whether it is suitable for land reform purposes; whether any consultations were undertaken with the owner of the property; what will happen to the farmworkers and their families after expropriation; and whether the owner of the property was given an opportunity to be heard.[71] Since Article 16(2) stipulates that the procedure and the requirements concerned are to be determined by an act of parliament, the power to expropriate becomes statutory, and therefore subject to Article 18, which requires administrative officials to act fairly, and to comply with the requirements that are imposed by relevant legislation. In this way, administrative justice is ensured.

In terms of other forms of property, such as intellectual property, where protection is provided by the Copyright Act 6 of 1994, by the Trade Mark Act 48 of 1973 and by the Patents Act 9 of 1916, a specific act of parliament regulates the expropriation of intellectual property in Namibia. This was affirmed in the case of *Gemfarm Investment*

69 Amoo (2014:70).

70 *Kessl v Ministry of Lands and Resettlement & Others* 2008 1 NR 167 (HC).

71 *Gunther Kessl v Minister of Lands and Resettlement & Other* (P) A 27/2006.

(Pty) Ltd v Trans Hex Group (Pty) Ltd and another, as can be seen in the quotation below, with regard to the legislation on intellectual property law that is currently in place in Namibia:

> In a world increasingly driven by globalized economies and markets; in an age where more technological advances have been made in a single century than in all the centuries which have preceded it combined; at a time when commerce and industries are increasingly based on and benefiting from the power of knowledge converted into ideas, inventions and technologies for the benefit of humankind and its environment, it should be a serious legislative concern that our statutory laws designed to record, preserve and protect those ideas, inventions and technologies are marooned in outdated, vague and patently inadequate enactments passed by colonial authorities in this country about a century ago.[72]

What a foreign investor can do, perhaps, is to make use of international agreements relating to intellectual property rights that Namibia has concluded for guidance. With regard to non-commercial agricultural land, no specific procedures exist in regard to expropriation, even though Section 4 of the Land Tenure Act of 1966 provides for the acquisition of land for farming purposes. In addition, Section 16(2) of the Communal Land Reform Act of 2002 requires just compensation when a communal land area is withdrawn. Compensation is to be given when the state acquires such rights as customary farming and residential unit rights that are held by persons.[73]

The Foreign Investment Act does not set out all the procedures and the requirements for expropriation in its provisions, since Section 11 only deals with compensation. This lack of clarification has led to uncertainty on how to deal with expropriation. The Act does not provide guidelines that can be used in a case of expropriation, resulting in the need to consult other legislation that deals with expropriation.

Section 13 of the Act contains a provision on the settlement of investment disputes and specifically allows international arbitration. In fact, it is the preferred method, in terms of Section 13(1). The UNCITRAL Arbitration Rules are to be applied to all disputes that are subject to international arbitration, unless the parties have agreed otherwise, in terms of the Certificate of Status Investment. According to Section 13(4)(a), it is only if no provision is made for international arbitration that a party to a dispute can approach a court in Namibia for a remedy. Thus, there is no provision for the exhaustion of local remedies, as recommended by the SADC Drafting Committee. One of the reasons for this is, perhaps, that no domestic arbitration body exists in Namibia. Namibia follows the approach used under customary international law with regard to international arbitration.

The Act does not have provisions on the full protection and security, or on the MFN, and the FET standards. Apart from the FET and the MFN treatment provisions that are recommended to be excluded from BITs, the full protection and security provision is an

72 *Gemfarm Investment (Pty) Ltd v Trans Hex Group (Pty) Ltd and Another* (P I 445/2005) [2009] NAHC 24 (7 April 2009) 3.

73 Section 16(3) of the Communal Land Reform Act 5 of 2002.

important standard that offers protection to foreign investors. This means that foreign investors from states that did not conclude a BIT with Namibia may not have a basis or recourse in terms of the Act, if such a violation were to occur. The foreign investors who suffer loss, or damage owing to armed conflict, revolution, or a state of emergency, lack recourse under the Act in terms of restitution, indemnification, or compensation. A conclusion that can be drawn with regard to the Foreign Investment Act is that, although the Act follows the approach that is taken under customary international law, it does not provide adequate protection to foreign investors. This is because of the absence of fundamental provisions and the uncertainty in some of the provisions, and due to the uncertainty that exists in some of the provisions that are included in the Act. The Foreign Investment Act is currently under review, and a bill has been tabled in this regard which is awaiting parliament's approval.[74] According to the Minister of Trade and Industry, the purpose of the review was to cover current local and international developments and to include all investment laws in one act.[75] Having one domestic act that applies to both domestic and foreign investors ensures the practice of non-discrimination in terms of the applicable laws. In addition, there is an emphasis on domestic laws that are geared towards encouraging growth at home. Although the outcome of the review has yet to be observed, the new act needs to meet international standards, in terms of an obligation that is set in Article 144 of the Namibian Constitution.

5.2 National Laws and Policies Affecting Foreign Investors

The Namibian legal system protects and facilitates acquisition and disposition of property such as land, buildings, and mortgages. All deeds of sale are registered with the Deeds Office. Property is usually purchased through real estate agents and most banks provide credit through mortgages. The Namibian Constitution prohibits expropriation without just compensation.[76] Just as in the case of South Africa, the Constitution is the supreme law of the land, in terms of Article 1(6), and all laws should accord with it. Thus, investment laws in Namibia also need to be in conformity with the Constitution. The principles of equality and non-discrimination, which are entailed in both the NT and MFN treatment, are also provided for in Article 10 of the Constitution.

Before independence, the apartheid system racially discriminated between black and white people in Namibia. Although apartheid came to an end when Namibia attained independence in 1990, many Namibians suffered socially, educationally, and economically as a result of the apartheid laws and regulations that were discriminatory. Article 23 of the Constitution was included, as a remedy, for those who had suffered at the hands of the apartheid authorities, in order to try and equalise the interests of those who had been adversely affected by the regime. Women are specifically referred to in Article 23, as some of those who have suffered, not only from past apartheid

74 Ngatjiheue (2014).
75 (ibid.).
76 Cf. US Department of State (2013).

laws, but also from discriminatory cultural practices. Therefore, the Constitution in Article 23 allows parliament to enact legislation for the advancement of those who have suffered, as a remedy for the imbalance, and this is why some of Namibia's legislation contains provisions granting privileges to Namibians who fall into the above-mentioned categories. This is affirmed in Article 95(g), which allows the government to enact policies that promote, and maintain, the welfare of the incapacitated, the indigent and the disadvantaged. As a result, the Affirmative Action Act 29 of 1998 was enacted with the aim of, *inter alia*, redressing, by means of appropriate affirmative action plans, the conditions caused by previous disadvantage in employment, arising from past discriminatory laws and practices. Affirmative action laws are an exception to the equality that is provided for in Article 10, and they are an exception to the NT provision. Foreign investors should be informed of the laws in question when they are admitted as investors in Namibia.

The Agricultural (Commercial) Land Reform Act 6 of 1996 was enacted in terms of Articles 23 and 16(2), which give the state the power to expropriate property in Namibia, in accordance with the procedure, and the requirements to be determined by an act of parliament. Unlike Section 25 of the South African Constitution, which is not only more detailed, but which also stipulates the nature of public purpose, and what to consider when determining compensation, Article 16(2) of the Namibian Constitution first requires an act of parliament to be enacted that sets out the requirements for expropriation. The framers of the Act had, among other intentions, the aim of allowing for the acquisition of agricultural land by the state, for purposes of land reform, and the aim of regulating the acquisition of agricultural land by foreign nationals.[77] The Act, which affects the provisions on expropriation, and on NT, is applicable to foreign investors who have agricultural land in Namibia.

The Minister is given the power to acquire agricultural land in terms of Section 14, so that the land can be made available to Namibians who have none, as well as to those with inadequate land, and to those who were previously disadvantaged socially, economically, and educationally by the previous laws, which were discriminatory. Certain requirements, however, should be followed in acquiring agricultural land. These include the inspection of the land to be acquired; consultations to be held with the owner of the land; the evaluation of such land; public consideration; and the payment of compensation.[78] Where such procedures are not followed, a foreign investor has a remedy, both under the Constitution in terms of Articles 18 and 25, as well as under the Agricultural Act itself. Therefore, where the procedures that are determined by an act of parliament are followed, the expropriation of foreign investors' property is lawful, and there is no violation of the NT.

The Namibian Competition Act of 2003 is another piece of legislation affecting the activities of foreign investors. Although the Act has to do with the promotion of

77 See the Preamble of the Agricultural (Commercial) Land Reform Act.

78 Sections 15, 20(6) 23, 24, 25, and 26 of the Agricultural (Commercial) Land Reform Act.

competition in Namibia, it recognises, in Article 2(d), the role that is played by foreign competition in Namibia. The Act also recognises the needs of historically disadvantaged persons, by including the promotion of a greater spread of ownership than in the past among such persons in its aims. This is an exception to the NT provision, in terms of relating to competition affecting foreign investors. This was one of the conditions that was set out by the Competition Commission, in an application for Walmart to merge with Massmart Stores, in the *Walmart Stores Corp* case. The reason for the condition to be brought into play was that the merger in question might have negatively affected the ability of small undertakings in Namibia to compete in the local markets, or it might have led to their foreclosure. Even though preventing such negative effects is one of the purposes of the Competition Act, the above-mentioned condition was held to be in violation of Section 3(3) of the FIA, which states that a foreign national is not required to provide for the participation of the government, or any Namibian shareholder, in an agreement, unless the condition pertains to the granting of a licence, such as in regard to the exploiting of natural resources. In addition, the Court stated that the Competition Act does not confer the power to impose such a condition upon the Commission, which is a power that was supposed to have been included in Section 47 of the Act. The Competition Act is currently under review.

A state's sovereignty, whether territorial or economic, is important and can often have an effect on national legislations. Article 100 of the Namibian Constitution vests sovereign ownership of natural resources into the state if not lawfully owned.

The Namibian National Reinsurance Corporation Act 22 of 1998 was enacted to provide for the establishment of the Namibia National Reinsurance Corporation (NamibRe). The objectives of NamibRe are, among others, to promote the development and the participation of Namibians in the insurance and reinsurance industry in Namibia, so as to create, develop and sustain local retention capacity in insurance and reinsurance business, and so as to minimise the placement of insurance and reinsurance business outside Namibia.[79] In terms of Part V of the Act, NamibRe had to have more than 50% of the shares, with the insurers being required to have certain assets in Namibia, and NamibRe regulating the extent and nature of investment that an insurer might invest outside the country. In addition, Regulations 4, 5, and 6 required that, when investing, at least 35% of the investments had to be made in Namibia. Part V of the Act was challenged in the case of *Namibia Insurance Association v Government of the Republic of Namibia* 2001 NR 1. The applicants submitted that Part V of the Act deprived the insurers of their capacity to build up reserves. As a result, they claimed that the provisions were in conflict with their right to do business in terms of Article 21(1)(j), as well as with their right to property in terms of Article 16 and their right to equality in Article 10 of the Constitution.

The Court stated that the above-mentioned issues related to the question of the economic freedom of a state. In rejecting the applicant's claim, the Court stated that the short-

79 Section 20 of the Namibian National Reinsurance Corporation Act 22 of 1998.

term insurance industry is overwhelmingly controlled directly or indirectly by foreign companies, which are mainly South African, and that is due to Namibia's colonial relationship with South Africa. As a result, the legislature chose to build up the Namibian reinsurance industry through a state-controlled national insurer, and by means of cutting foreign participation, in order to give effect to the principles of the state policies stated in Article 89, as read together with Article 101 of the Constitution. Thus, the aims of the Act were regarded as being legitimate, and not inconsistent with the Constitution, as the applicants claimed. In addition, the Court held that it is undesirable for courts to interfere with the regulation of economic activities, because they essentially deal with political questions with which judicial officials are not equipped to deal. The Court said, that it is at the discretion of the legislature to regulate the form and degree of economic activities. Therefore, the Court rejected the claim that the Act restricted the applicant's economic freedom.

The Electricity Act 4 of 2007 concerns not only electricity supply, but also foreign investors in the electricity industry. The Act has, among others, the purpose of ensuring efficient provision of electricity in the country, and promoting private sector investment in the electricity industry.[80] The Act places an obligation on licence owners to supply electricity to every person within the area of the licence and capable of making payments.[81] In addition, the Act also has a provision for expropriation in terms of Section 35. Expropriation in terms of the aforementioned section must be in the public interest for any purpose associated with the provision of electricity by the licensee. No doubt, just like any other expropriation, all requirements need to be followed for the expropriation to be lawful.

In 2000, the government established the Electricity Control Board (ECB), which is responsible for regulating the energy sector. The ECB's core function is to regulate electricity generation, transmission, distribution, supply, and import and export within the country; and the board is mandated to recommend to the Minister of Mines and Energy which companies or entities should receive licenses. The ECB's vision is for Namibia to have a competitive and transparent electricity market. However, the Namibian parastatal responsible for providing electricity, NamPower, currently still enjoys a virtual monopoly, although procedures for the establishment of independent power producers (IPP) already exist.[82]

5.3 The Application of International Investment Law in Namibia

When analysing the formal sources of investment law, one must investigate a concurrence of international, regional and domestic law. Concurrence does not necessarily mean that international, regional and domestic investment law are hierarchically related. Rather the

80 Section 3(1)(c) and 3(1)(e) of the Electricity Act.

81 Section 28 of the Electricity Act.

82 Cf. US Department of State (2013).

contrary: they should be understood as being cumulatively applicable.83 International investment law is not organised around a multilateral treaty or central organisation; it is much rather governed by public international law and domestic investment law under an array of bilateral, regional and multilateral treaties (BITs, RECs, FTAs etc.).

Jurisdiction over international investment law is, *inter alia*, derived from contracts, treaties and insurance schemes falling under arbitral institutions (i.e. ICSID, UNCITRAL, etc.) and domestic courts. There is no uniform body of adjudication,[84] and, in the absence of such central authority or constitutional setting, international investment law emerged more organically or perhaps also accidentally into a separate field of the law, oscillating between neighbouring, related and at times overlapping regimes of, among others, diplomatic protection, international arbitration, property law, contract law, international trade law, and even human rights.[85]

Article 144 of the Namibian Constitution provides for the application of international law to Namibia. Article 144 reads as follows:

> Unless otherwise provided by this Constitution or Act of Parliament, the general rules of public international law and international agreements binding upon Namibia under this Constitution shall form part of the law of Namibia.

Thus, public international law and international agreements are part of the Namibian legal framework, provided that such international law is in conformity with the Constitution, which is the supreme law in Namibia. Namibia follows the monist approach, meaning that, in terms of the Constitution, international law applies automatically, without the need for its transformation, or its incorporation, into legislation. Thus, the effect of Article 144 of the Constitution is that a treaty will be binding upon Namibia if international and constitutional requirements are met without the need for a legislative act.[86] This is pretty unique on the African continent. However, in a situation where there is uncertainty, or where there is a dispute between national and international law, the court, as in the case of *Kauesa v Minister of Home Affairs and Others* 1994 NR 102 at 103D, will state that the international law should be given considerable weight.

Namibia is a member of SADC and, as part of the Drafting Committee on the SADC Model BIT, it is expected to adjust its investment laws to make them of the same standard as the recommended one. In addition, it is a signatory to the ICSID Convention, although the Convention has yet to be ratified.

5.4 Bilateral Investment Agreements Concluded by Namibia

A number of countries have entered into Reciprocal Promotion and Protection of Investment Agreements (RIPPAs) with Namibia. Such agreements are BITs with

83 Griesel (2014:215).

84 Pauwelyn (2014:14).

85 With further references Pauwelyn & Parparinskis (2014:73ff.).

86 Ruppel (2010b:351).

reciprocal benefits, and foreign investors from the countries concerned are able to be accorded protection under the BITs concerned.[87] It has become common practice for the BITs that are concluded by Namibia to include a provision on non-discrimination, at least in terms of the management, the operation, the maintenance, the use and the enjoyment pertaining to foreign investors. The BITs do not include the wording of the SADC Model BIT of "like circumstances". Thus, the NT standard provision, as seen in Namibia's BITs, is that which falls under customary international law, rather than the one that is present in the SADC Model BIT Template. In addition, the BITs that are concluded by Namibia do not contain schedules with sectors, activities or measures where the NT and most MFN treatments do not apply.

Thus, foreign investors have to regard the national laws with care. The full protection and security provision is also seen in the BITs that are concluded by Namibia. The Austria-Namibia BIT, for example, provides for an even higher standard of protection by referring to this right as "full and constant security and protection". As constant security and protection has to do with ongoing practice, this means that foreign investors are to be protected at all times when conducting their businesses in the host state. Similarly, in the Netherlands-Namibia BIT, reference is also made to non-discriminatory security and protection, requiring non-discrimination principles to apply to the security of foreign investors as well.[88] Just like under customary international law, the provision on the full protection and security standard is included in the FET provision. With regard to the FET, Namibia's BITs also adhere to the standard under customary international law. The problem of what the FET entails is also seen in Namibia's BITs because the provisions merely state that foreign investors, or their investments, are to be accorded the FET.

The fair administrative treatment that is preferred by the Drafting Committee, although not expressly stated, is seen in some of the provisions of BITs. This appears, for instance, in the transparency provision in the Austria-Namibia BIT, which requires the contracting states to make its laws, regulations and procedures publicly available.

Furthermore, Namibia's BITs follow the method of considering the fair market value of the property when determining compensation for foreign investors. Unlike the FIA which only provide for compensation, the BITs deal with the issue of expropriation by including the requirements as well. This places foreign investors from states that have concluded BITs with Namibia at an advantage at least when they are dealing with expropriation, because of the clear procedures that are laid down in the BITs, unlike in the Act.

87 Existing BITs concluded by Namibia and the following countries: Angola, Austria, China, Cuba, Finland, France, Germany, Italy, Malaysia, Netherlands, Russian Federation, Spain, Switzerland and Vietnam, UNCTAD (2013).

88 Article 3 (1) of the Agreement on encouragement and reciprocal protection of investments between the Kingdom of the Netherlands and the Republic of Namibia, available at http://www.wipo.int/wipolex/en/treaties/text.jsp?file_id=310053, last accessed 22 December 2014.

A violation of a BIT provision on expropriation is seen in the case of *Gunther Kessl v Minister of Lands and Resettlement & Others,* where expropriation occurred in terms of the Agricultural Commercial Land Reform Act. Kessl was a German national who owned a farm in Namibia. Kessl and his fellow litigants alleged that the government had singled out foreign-owned land for compulsory acquisition, on the basis that the owners of the property were foreigners, leading to the government violating both the Constitution, and Namibia's BIT with Germany.[89] The relevant BIT between Namibia and Germany was included in a chronology by the applicants. These challenged the expropriation by claiming, *inter alia,* that the expropriation was based on nationality, and that the correct procedure, as set down by the Act, which required consultation, and evaluation of the property, was not followed.[90] As a result, there was no administrative justice in terms of Article 18 of the Constitution. In addition, the claimants went on to criticise the government's failure to pay any attention to the terms of the BIT, which by virtue of its ratification had further become part of Namibian law:

> It is respectfully submitted that the Minister and the Commission clearly failed to have regard to the international obligations of Namibia in the decision-making process. The Minister did not at the time, nor indeed in subsequent correspondence, apply his mind in any way to the existence of, or the important impact of, the Treaty. He and the Commission acted illegally in failing to respect the law of Namibia which obliged German nationals to be treated in exactly the same way as nationals of Namibia.[91]

The High Court observed that Namibia was bound to comply with the Treaty:

> As German citizens, the three applicants are entitled to the same treatment as Namibian citizens in terms of the Encouragement and Reciprocal Protection of Investments Treaty which was entered into by the Republic of Namibia and the Government of the Federal Republic of Germany.[92]

The Court held that, when the Minister considers expropriating a particular farm, the *audi alteram partem* rule should be observed. For instance, the landowner should be afforded the right to be heard, and notice should be served on the land-owner. The Court held that there was a violation of Article 18, and allowed a review of the Minister's decision, in terms of Article 25 of the Constitution. Thus, although the Court based its decision mainly on the fact that Article 16 was not respected, and on the fact that the procedures followed had contravened Articles 18 and 25, it also recognised the fact that the Namibian government had to respect the provisions of the BIT that it had previously concluded with Germany, and specifically, in this case, those relating to the NT and to expropriation.

89 G*unther Kessl v Minister of Lands and Resettlement & Other* (P) A 27/2006. For commentary on the decision, see Sidney & Odendaal (2008:10).

90 Sidney & Odendaal (2008:11).

91 *Gunther Kessl v Minister of Lands and Resettlement & Other* (P) A 27/2006.

92 (ibid.).

With regard to dispute settlement, Namibia's BITs follow the approach taken under customary international law, because they provide for international arbitration as a mechanism for the settling of disputes. In addition, dispute settlement gives an option to a state, or to a foreign investor, to settle its dispute domestically through a competent court or tribunal. What is common to the BITs is the provision of the ICSID as an institution by means of which investment disputes can be settled. In terms of Article 12 of the Namibia-Austria BIT, the investor may choose to submit a dispute to a court, or to an administrative tribunal, in the host state. The disputes are to be resolved by means of the use of amicable and time-efficient methods, such as negotiation and mediation as a possible first option. Only if such methods fail, can the parties concerned submit the matter to litigation or arbitration. Secondly, an investor may choose to submit the dispute in accordance with any agreed dispute procedure. Thirdly, the dispute may be submitted to the ICSID, to a sole arbitrator, or an ad hoc arbitration tribunal that is established in terms of the Arbitration Rules of the UNCITRAL; or to a sole arbitrator, or to an ad hoc tribunal that is established under the Arbitration Rules of the International Chambers of Commerce (ICC).[93]

The BIT between Namibia and Spain also gives options to the parties to the dispute. In terms of Article 11 of the agreement, the parties can either submit the dispute to a local court, or make use of the UNCITRAL Arbitration Rules, or the ICSID Convention.

The Namibia-Netherlands BIT provides for the ICSID to be used for the settlement of disputes if both parties are members thereof. Alternatively, parties should make use of the ICSID Additional Facilities if one of the parties to the dispute is not a member of the said Convention. The BIT between Germany and Namibia also provides for disputes to be resolved by the ICSID. The above-mentioned BITs, just like the provisions in the Foreign Investment Act, do not provide for the exhaustion of local remedies as is recommended by the Drafting Committee of the SADC Model BIT Template.

6 Conclusion

Many countries in Southern Africa, like Namibia, are at the crossroads in terms of the electricity challenge and are faced with a threatening power crisis. While the majority of the population in SADC still have no access to electricity, the potential of renewable energy is enormous, especially in respect of hydropower, solar power, bioenergy, wind energy, geothermal energy as well as energy generation from local biomass. National lawmakers need to find the best solutions for improved energy security in the immediate future. There is an urgent need to develop and exploit the region's enormous renewable energy resources. An investor-friendly environment and effective regulatory regimes play a crucial role in this matter.

Namibia, as reflected elsewhere in this publication, presently has the capacity to develop its policies and regulatory framework dealing with renewable energy and to serve as

93 See Article 12 of Namibia-Austria BIT, Article 9 of the Namibia-Netherlands Agreement, Article 11 of Namibia-Spain BIT and Article 11(2) of the Namibia-Germany BIT.

an example for the rest of the SADC region and beyond. If the government turns this urgency into a national policy goal, a run on investment in renewable energy in Namibia could begin. An act of parliament regulating the sector more comprehensively and providing Namibia and its people with much-needed energy security may be the way forward.

SADC and the Namibian government intend to promote the use of renewable energy. An appropriate and enabling investor's environment to facilitate meaningful development is key in this matter. Namibia has laws in place that can be used to protect its investors. However, because of the exclusion of some important provisions, and the violation of others, it is recommended that Namibia should ratify the ICSID Convention, since it has already signed the Convention. That ICSID is a preferred institution when settling investment disputes becomes evident under international law, as well as in terms of the BITs, and in terms of the SADC Model BIT template.

The use of arbitration has been on the increase, because of the many advantages that are associated with it, such as the confidentiality, the privacy, the use of informal rules and procedures, and the choice of the applicable rules by the parties concerned. Namibia uses the same arbitration legislation as South Africa, namely the Arbitration Act of 1965, although, unlike South Africa, Namibia is not party to the New York Convention on the Recognition and Enforcement of Foreign Arbitral Awards of 1958. This means that it will be so difficult to enforce foreign arbitral awards in a Namibian court that the rules of private international law will have to be applied. However, if Namibia ratifies the ICSID Convention, it will be relatively easy to enforce foreign awards, because, in terms of the Convention, ICSID awards are given the same status as national court judgments, and they are also binding on the parties concerned.

There is also a need to include a provision on full security and protection for investors in the Namibian Foreign Investment Act. Such a provision is responsive to international law and is also recommended by the SADC Drafting Committee for its members. The inclusion of such a provision in the Act would be advantageous both for the foreign investors from countries that have not concluded a BIT with Namibia, and for local investors, because it sets out a specific standard to which the state is obliged to conform. Such an inclusion would also promote non-discrimination between investors from countries that have concluded BITs with Namibia, local investors, and other investors from non-contracting BIT countries. Moreover – looking at experiences over the Zimbabwean border – it may be advisable that the Namibian Foreign Investment Act contains a more elaborate provision on expropriation that includes the requirements for expropriation as they are currently provided for in the country's BITs.

A country's competitiveness in an increasingly globalised world is dependent on how it is perceived by its foreign investment partners.[94] Southern Africa must attract investment in energy security. This in turn will require political support, competence and courage in making foreign investment as attractive as it needs to be.

94 *Ubuntu* (2014a and b).

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13.
FISCAL INCENTIVES TO ADVANCE THE UPTAKE OF RENEWABLE ENERGY IN SOUTH AFRICA

Lee-Ann Steenkamp

1 Introduction

According to the International Energy Agency (IEA) *World Energy Outlook 2015*, South Africa accounted for more than one-third of the total energy-related CO_2 emissions on the African continent.[1] The same report states that emissions in South Africa are projected to follow a 'peak, plateau and decline' trajectory, largely due to improved energy efficiency and a turn towards renewables and nuclear energy.[2]

The Organisation for Economic Cooperation and Development (OECD) conducted an environmental review of South Africa during 2013. It found that South Africa's biodiversity is one of the richest in the world, yet at the same time the country's economy is also one of the most energy- and carbon-intensive.[3] On a more positive note, the OECD also notes that South Africa has been implementing the principles of green tax reform, albeit still to a limited extent.[4] Indeed, revenue from environment-related taxes has increased in recent years owing to new taxes being introduced (e.g. on electricity and cars). Moreover, in 2011, environment-related taxes accounted for about 2,1% of South Africa's gross domestic product (GDP), which is close to the OECD average.[5]

Environmental challenges are increasing the pressure on governments to find ways to reduce environmental damage, while minimising obstacles to economic growth.[6] Governments have a range of tools at their disposal, including regulations, information programmes, innovation policies, environmental subsidies and environmental taxes.[7]

Environmental taxes involve using the tax system to adjust relative prices with a view to influencing producer or consumer behaviour in favour of goods or services that are considered to be environmentally beneficial.[8] These tax instruments effectively transfer

1 IEA (2015a:64).
2 (ibid.:65).
3 OECD (2013:20).
4 (ibid.:78).
5 (ibid.:70).
6 OECD (2011:1).
7 (ibid.).
8 Greene & Braathen (2014:5).

resources from the taxpayer to the beneficiaries of the tax instrument and can take several forms, namely tax expenditures, tax breaks, tax relief or tax subsidies.[9]

This article examines the tax relief (or incentives) that the South African National Treasury offers to taxpayers. A tax incentive can take the form of a tax credit or deduction which results in less tax owed by the taxpayer to the revenue authority. A tax credit is a rand-for-rand credit reduction in a taxpayer's income tax liability. A tax deduction reduces the taxable income and therefore lowers the tax liability proportionately.

The article discusses five prominent income tax incentives aimed at encouraging taxpayers to invest in renewable energy. Excluded from the scope of this article are the proposed carbon tax (see sub-section 4) and environmentally tax-related incentives which do not directly relate to renewable energy.[10] Moreover, the article only examines incentives contained in the Income Tax Act 58 of 1962, and does not address tax relief offered by other tax legislation, for example value-added tax (VAT). All references to 'government' pertain to the South African government.

2 Energy Efficiency – Section 12L

2.1 Background

Government recognised in 2009 that energy efficiency savings could be viewed as 'one of the low-hanging fruits' to help address climate change and energy security concerns. Acknowledging that the often substantial amount of capital expenditure and the perceived long pay-back period discouraged business from making upfront investments relating to energy efficiency savings, National Treasury wanted to encourage the conversion of old technologies to new, energy efficient ones.[11] Section 12L was accordingly introduced to the Income Tax Act during 2009. The original version was then completely replaced by a substituted provision which represents Section 12L in its current form. The new version came into effect on 1 November 2013.

During the May 2013 budget vote speech, the Department of Energy indicated that energy efficiency was one of the areas in which the country was not performing as well as had been anticipated.[12] On 4 December 2013, the director-general of the Department of Energy announced the launch of the Private Sector Energy Efficiency (PSEE) Programme.[13] The PSEE Programme resorts under the umbrella of the UK-

9 (ibid.).

10 These include, for example: the Section 37A deduction for mining companies which apply their property for the environmental rehabilitation of mining areas; the Section 37B deduction for environmental treatment and recycling assets; the Section 37C deduction for environmental maintenance rehabilitation and management expenses; and the new Section 37D allowance for land declared as conservation for nature reserves or national parks.

11 National Treasury (2009:29).

12 Department of Energy (2013).

13 For more information on the PSEE project see http://www.psee.org.za/About/Overview,

SA bilateral relationship and is led by the Department of Energy. It aims to improve energy efficiency in commercial and industrial companies in South Africa by assisting companies to identify and implement energy-saving measures. The director-general explained the linkage between Section 12L and the PSEE Programme and noted that –

> ...as government, we view the opportunity presented by the energy efficiency tax incentives as the proverbial carrot, as it is one of the key mechanisms to soften the impact of "the stick", the proposed Carbon Tax Policy due for implementation in 2015.[14]

2.2 Qualifying Criteria and Workings

Section 12L is a notional allowance for all forms of energy efficiency savings resulting from activities in the production of income. Basically, this incentive enables the taxpayer to capture the full profit from energy efficiency savings during each year in which incremental energy efficiency savings are initially realised. The corresponding Regulations on the Allowance for Energy Efficiency Savings (the Regulations) were published on 9 December 2013.[15] The criteria and methodology used to claim allowances, calculate the baseline and determine the limitations of the allowance must be in terms of the Regulations, which are issued by the minister of Energy after consultation with the minister of Finance and the minister of Trade and Industry.

Originally, a taxable income deduction for energy efficiency savings was based on a formula. In its current format, Section 12L provides that a taxpayer will be entitled to a deduction of 95 cents per kilowatt hour (c/kWh) of energy efficiency savings. The incentive is available for any person carrying on a trade during any year of assessment ending before 1 January 2020.

National Treasury deemed the previous rate of 45c/kWh as insufficient to incentivise energy efficiency projects and accordingly proposed to increase the allowance to 95c/kWh with effect 1 March 2015.[16] The amendment has a dual purpose, namely to offset high upfront capital costs and compliance cost. The latter refers to the measurement and verification of savings to obtain an energy efficiency savings certificate.

The Regulations impose various administrative burdens on the taxpayer in order to claim the allowance. One such duty is that the taxpayer must register with the South African National Energy Development Institute (SANEDI) in respect of any energy efficiency savings measure for which the allowance is intended to be claimed.[17] SANEDI will

last accessed 22 November 2015.

14 See http://www.gov.za/media-statement-director-general-department-energy-ms-nelisiwe-magubane-release-regulations, last accessed 29 January 2016.

15 SARS subsequently issued Regulation R.186 on 9 March 2015, which deals with the amendments of the original regulation.

16 Per the Taxation Laws Amendment Act No. 25 of 2015, promulgated on 8 January 2016. The new rate will apply retrospectively from 1 March 2015.

17 SANEDI was established in April 2011 in terms of Section 7 of the National Energy Act

maintain a database of all the reports and certificates issued and will provide ready access to this information to the minister of Finance and the commissioner of the South African Revenue Service (SARS).[18] A number of uncertainties have arisen as to the application of Section 12L, but these interpretational quandaries will not be discussed here.[19]

Below is an illustrative example of the after-tax effect of Section 12L, based on the current 95c/kWh allowance.[20]

Illustration of the after-tax effect of Section 12L, based on the current 95c/kWh allowance

Hypothetical example: Assume that a local company has an equivalent diesel fuel saving of 1 000 000 kWh per year. Assume further that the average cost per kWh to the end-use customer is R1,21/kWh. Ignoring other cost implications, the value of the savings would amount to R1 210 000 per year. All else being equal, this saving will positively impact on the bottom-line of the business and increase profit for the year by R1 210 000. This will result in an increase in the company's taxable income by R1 210 000. The results prior to and post application of Section 12L are as follows:

Results:

Tax effect prior to the Section 12L incentive	
Increase in taxable income	R1 210 000
Company's normal tax rate	x 28%
Normal tax	R338 800
Tax effect subsequent to the Section 12L incentive	
Increase in taxable income	R1 210 000
S 12L deduction: 1 000 000 kWh x R0,95	(R950 000)
Taxable income	R260 000
Company's normal tax rate	x 28%
Normal tax	R72 800
Net benefit after tax: R338 800 – R72 800	R266 000
Savings expressed in kWh: 95c x 28% or R266 000 / 1 000 000 kWh	26,6c/kWh

No. 34 of 2008.

18 For a discussion of other practical considerations, see Steenkamp (2015:70-72).

19 For an in-depth analysis, see Seligson (2015).

20 This example is derived from Steenkamp (2015:71).

A simplified way of looking at Section 12L is therefore to consider the after tax benefit for a company, viz. 26,6c/kWh for each kWh saved over the lifetime of the project. It should be pointed out that no deduction is available if the taxpayer receives a concurrent benefit in respect of energy efficiency savings. This might include a cash grant offered by the Department of Trade and Industry (DTI) for any energy efficiency savings.

3 Capital Allowance for Renewable Energy Machinery – Section 12B

3.1 Background

In 2004, the South African government provided accelerated depreciation for investments in biodiesel and biofuels by introducing a special allowance for movable assets used in the production of renewable energy.[21] Building on this initiative, the 2005 national budget speech proposed to extend accelerated depreciation to other forms of environmentally friendly energy sources.[22] Consequently, other renewable energy investments, such as solar energy and windmill technology, henceforth qualified for the Section 12B allowance.

In light of the current and projected national shortage of electricity in the foreseeable future, government acknowledged that South Africans would be 'inconvenienced' and economic activity 'constrained'.[23] In fact, the unreliable electricity had already caused National Treasury to revise its estimate in gross domestic product (GDP) growth downwards to 1% for 2015.[24]

As part of its short-term interventions to limit the impact of electricity shortages on the economy and drive growth and job creation, government encourages investment in cleaner energy forms to reduce greenhouse gas (GHG) emissions and to broaden South Africa's energy sources.[25] As a result, National Treasury has recently revisited the Section 12B allowance.

3.2 Qualifying Criteria and Workings

Section 12B allows a deduction over three years in respect of any machinery, plant, implement, utensil or article (referred to as a qualifying asset) owned by the taxpayer, on the basis of 50% in year one, 30% in year two and 20% in year three. The allowance is only available if the asset is brought into use for the first time by the taxpayer.[26]

21 In the absence of Section 12B, the taxpayer would have to claim the capital allowance provided for in Section 12C, which is over either a four- or five-year period.

22 Manuel (2005:89).

23 National Treasury (2015:42).

24 Nene (2015:20).

25 National Treasury (2015:42).

26 It should be pointed out that the allowance is not limited to new or unused assets. The phrasing merely prevents the taxpayer from claiming the allowance twice in respect of the same asset.

The asset must be brought into use for the purposes of the taxpayer's trade in order to generate electricity from the following renewable energy sources:

- wind power;
- solar energy;
- hydropower (gravitational water forces) to produce electricity of not more than 30 megawatts; and
- biomass comprising organic wastes, landfill gas or plant material.

As previously mentioned, the allowance is only available for movable assets and cannot be claimed on, for example, buildings. As regards the cost of the asset, improvements and foundations are included.

If the taxpayer leases the asset and undertakes obligatory improvements in terms of a public-private partnership (or for obligations incurred on or after 1 January 2013), the Independent Power Producer Procurement Programme (IPPPP) will apply.[27] This means that if the lessee uses the asset for purposes of earning income, depreciation will be allowed on those improvements as if the lessee owned the underlying property directly.

Since 1 January 2013, the allowance has been available also for foundations or supporting structures that are deemed to be part of the qualifying asset. In order to be deemed part of the asset, the following requirements must be met:

- the asset is mounted or fixed to any concrete or other supporting structure or foundation;
- the supporting structure or foundation is designed for the asset in such a way that it is an integral part of the asset; and
- the foundation or supporting structure has been brought into use on or after 1 January 2013.

A recent amendment will enhance the Section 12B allowance from its current three-year write-off period to a 100% allowance in the first year of use. This change is in respect of embedded solar photovoltaic (PV) renewable energy for self-consumption with a generation capacity of up to 1 000 kW (or 1 MW). The amendment will apply to years of assessment commencing on or after 1 January 2016.[28] The amendment is therefore aimed at increasing the uptake of embedded solar PVs for self-consumption to ease the pressure on the national electricity grid as these solar PVs become self-sufficient.

The reason for this improvement is that solar power is classified as a single concept within the current tax legislation, without delineating it into its different forms, such as solar PV or concentrated solar power.[29] Solar PV is favoured because of its low

27 This is in terms of Section 12N of the Income Tax Act. The IPPPP is administered by the Department of Energy.

28 Per the Taxation Laws Amendment Act No. 25 of 2015, promulgated on 8 January 2016.

29 National Treasury (2015:43).

environmental and water consumption impact, economies of scale and efficiencies of learning.[30] Furthermore, embedded solar PV does not require the infrastructure of large-scale PV projects (such as supporting infrastructure like roads and transmission lines) and is accordingly better placed to benefit from the accelerated initiative.[31]

A number of practical difficulties arise when interpreting the provisions of Section 12B. However, these technicalities are considered to be beyond the scope of this article.[32] If the taxpayer fails to prove that an asset is an integral part of the electricity generation process, one could always rely on other existing provisions in the Income Tax Act, although these might not be as beneficial. By way of example, an annual deduction of 6,67% for the cost of lines or cables used for the transmission of electricity is allowed.[33] As regards research and development expenditure, a 100% or 150% deduction may be claimed.[34] As a fall-back, the standard allowance for machinery and plant used directly in a manufacturing process is available.[35] Also, a further deduction may be claimed on qualifying industrial projects – this is the subject matter of paragraph 5.

4 Certified Emissions Reductions – Section 12K

4.1 Background

The government acknowledges that climate change is a reality and is caused largely by GHG emissions and concentrations in the atmosphere that are anthropogenic.[36] As a result, it has committed to ambitious GHG reductions and the proposed carbon tax is meant to change consumer behaviour and influence investors to shift towards low carbon options.[37]

The proposal for a carbon tax was first mooted by Cabinet in 2007. After a lengthy

30 (ibid.).

31 (ibid.).

32 For an analysis of these interpretational difficulties, see Steenkamp (2016:54-57).

33 This deduction is in terms of Section 12D of the Income Tax Act. Prior to 1 April 2015, the allowance was 5% per annum.

34 Qualifying research and development expenditure is claimed in terms of Section 11D of the Income Tax Act.

35 In terms of Section 12C of the Income Tax Act.

36 National Treasury (2013:21).

37 According to the Carbon Tax Policy paper (National Treasury (2013:8-9)), this change will be effected as follows:

> Carbon pricing will alter the relative prices of goods and services based on their emissions intensity, and by encouraging the uptake of cost-effective, low-carbon alternatives.
>
> The carbon-intensive factors of production, products and services are likely to be replaced with low-carbon-emitting alternatives.
>
> A carbon price will create dynamic incentives for research, development and technology innovation in low-carbon alternatives. It will help to reduce the price gap between conventional, carbon-intensive technologies and low-carbon alternatives.

public consultation process and debates, National Treasury published the *Carbon Tax Discussion Paper* in 2010. Further details were subsequently released in the national budget proposals of 2012. The process culminated in the publication of the *Carbon Tax Policy Paper* in 2013. However, the implementation of the carbon tax has been delayed numerous times. Set to come into effect during 2016, it is likely that further delays might ensue.

One of the options for a South African company to reduce its carbon footprint while simultaneously obtaining a tax benefit is by making use of Clean Development Mechanism (CDM) projects. The CDM is one of the key components of the Kyoto Protocol and provides developed countries with a mechanism to meet their own GHG emissions obligations by purchasing credits from CDM projects that avoid GHG emissions in developing countries. A CDM is defined in Article 12 of the Kyoto Protocol and allows for projects to earn saleable certified emission reduction (CER) credits, each equivalent to one tonne of CO_2, which can be counted towards meeting Kyoto targets.[38]

The mechanism stimulates sustainable development and emission reductions, while giving industrialised countries some flexibility in how they meet their emission reduction limitation targets. CDM projects focus on development in renewable energy, energy efficiency and other related fields designed to achieve emission reductions.[39] The carbon emission reduction credits from the CDM projects are known as CERs and are saleable to and usable only by developed countries.[40]

National Treasury addressed the limited uptake of CDM projects in South Africa by providing for greater tax relief.[41] This decision was considered part of South Africa's domestic policy response to climate change and was meant to overcome the market failure associated with environmental protection.[42] The tax relief came in the form of an exemption, contained in Section 12K of the Income Tax Act. This incentive is available for any person holding a CDM project registration while that person implements the project. Essentially, amounts received or accrued upon disposal of these CERs are exempt from normal tax and capital gains tax.[43] Section 12K came into operation on 11 February 2009 and applies in respect of proposals on or after that date.

Initially, Section 12K contained a sunset clause to coincide with the expiry of the Kyoto protocol on 31 December 2012. However, during the COP18 meetings held in December 2012,[44] the CDM was extended as a flexibility mechanism under the Kyoto

38 See UNFCCC (2015).

39 National Treasury (2010:para 4.3).

40 (ibid.).

41 National Treasury (2009:27) explains that the lack of uptake stemmed mainly from high financial (and bankable) hurdle rates, given the risks associated with CDM project activities. Also, in terms of tax, the disposal of CERs was largely untested, thereby creating further uncertainty for CDM projects.

42 National Treasury (2009:28).

43 Capital gains or losses are disregarded in terms of paragraph 64(b) of the Eighth Schedule to the Income Tax Act.

44 The COP18 meetings represented the 18th session of the Conference of the Parties to the

Protocol, enabling developing countries to continue their participation in the global carbon market. Consequently, Section 12K was amended on 1 January 2013 and the exemption was extended to 31 December 2020.

4.2 Qualifying Criteria and Workings

In order to qualify as a CDM project, an activity must obtain South African approval and United Nations Framework Convention on Climate Change (UNFCCC) registration. The South African approval is obtained from the Department of Energy, which is the 'designated national authority'. The UNFCCC Executive Board of the Clean Development Mechanism verifies and certifies CERs. Ultimately, CERs only come into existence after being issued by this board.[45]

At the time that the CER is granted to the taxpayer, no tax event arises. When the CERs are subsequently disposed of for proceeds, Section 12K deems that no taxable income results. Expenditure incurred in securing the approval and registrations required for the CERs will not qualify for a taxable deduction on the basis that those expenses were not incurred in order to produce income that is liable for tax.[46] Furthermore, by virtue of the fact that there is no receipt of taxable income, the value of CERs held by the taxpayer at year-end will not be taken into account as closing or opening stock.[47]

As regards value-added tax (VAT), the supply of CERs constitutes an export, thereby qualifying as a zero-rated supply. Moreover, it will be regarded as an export of services (as opposed to goods).[48] Consequently, the documentary requirements to satisfy SARS that the services have been exported are less stringent.[49]

UNFCCC and were held in Doha, Qatar.

45 For an interesting analysis of the legal nature of CERs and resulting tax consequences, see Garrod (2011).

46 National Treasury (2009:28) in conjunction with the workings of Section 23(f) of the Income Tax Act. Normally, non-capital expenditure actually incurred in the production of income and in the carrying on of a trade would qualify for a deduction from taxable income, in terms of Section 11(a) of the Income Tax Act.

47 National Treasury (2009:28). Section 22 of the Income Tax Act deals with trading stock.

48 National Treasury (2009:29). National Treasury reasons that the CER itself should fall within the ambit of a 'right' or a 'facility' or an 'advantage', as envisioned in the definition of services in Section 1 of the VAT Act.

49 However, it should be pointed out that, as the VAT Act does not specifically stipulate this, the VAT position remains somewhat unclear.

Example to illustrate the workings of the Section 12K exemption[50]

Hypothetical case: X Ltd is a South African company involved in a CDM project. The UNFCCC Executive Board issues CERs worth R5 million to X Ltd on 30 June 2013. X Ltd sells the CERs to a foreign company for R8 million on 31 December 2015.

Results: The mere receipt of CERs (i.e. R5 million) from the UNFCCC Executive Board is a non-event under common law principles. The proceeds from the disposal of the CERs (i.e. R8 million) will be exempt from tax in terms of Section 12K. The expenditure incurred by X Ltd will not qualify for a deduction. Also, the value of the CERs held by X Ltd will not be taken into account as closing or opening stock.

As the government is committed to reducing its GHG emissions, it is probable that South African companies would seek to acquire more and more CERs from foreign entities. This environmental obligation offers potentially beneficial tax consequences for such taxpayers.

5 Industrial Policy Project Allowance – Section 12I

5.1 Background

In a continuous effort to stimulate the industrial sector in line with the objectives of the National Industrial Policy Framework, government introduced two related incentive programmes for the manufacturing industry. The first was the industrial policy project allowance which was introduced as Section 12I of the Income Tax Act in 2008.[51] Section 12I is the successor to the former incentive for strategic industrial projects.[52] The other incentive was launched by the DTI on 3 July 2008 as the Manufacturing Investment Programme (MIP), which comprised a cash grant from Government. These incentives share similar qualifying criteria, but focus on investments of different sizes.[53]

Section 12I provides sizable allowances upon approval by a joint departmental National Treasury and Trade and Industry adjudication committee.[54] It provides an incentive to assist the transformation of current production processes and methods to attain cost

50 Adapted from National Treasury (2009:28).

51 The provision was promulgated only on 8 January 2009, but was subject to the publication of regulations by the minister of Finance pertaining to some of the qualifying criteria. The application and project adjudication criteria were gazetted only on 23 July 2010. In the absence of the regulations, it was not possible to apply for approval for potentially qualifying projects.

52 This repealed incentive was contained in Section 12G of the Income Tax Act.

53 Van Rensburg (2009).

54 National Treasury (2009:102).

reductions and greater efficiency in the use of resources. For example, projects must result in a minimum of 10% energy demand reduction in the year that the investment is realised.

The incentive takes the form of an immediate additional allowance for an industrial policy project as determined according to the type (greenfield or brownfield) and status (qualifying or preferred). Taxpayers only benefit from the incentive if they invest in improved production equipment and contribute towards the labour market.[55] Section 12I is available for the manufacturing sector in respect of new projects (greenfield projects) as well as for expansion or upgrades of existing projects (brownfield projects).

National Treasury notes that, since its inception in 2008, there has been a significant uptake of the programme.[56] By the end of March 2015, a cumulative 52 projects with an investment value of R48 billion have been supported and approved.[57] Based on consultations with relevant stakeholders, National Treasury acknowledged that there was uncertainty regarding the time frames with respect to compliance with all the requirements of Section 12I, resulting in few (if any) projects being able to comply with all the criteria in every year of assessment.

Consequently, a recent amendment extends the window period to align the section 12I allowance with the Manufacturing Competitiveness Enhancement Programme (MCEP). [58] The DTI provides a vast array of financial support to qualifying companies in various sectors of the economy.[59] The MCEP was launched on 4 June 2012 and is aimed at supporting enterprises in the production sectors to weather the global economic recession, raise their competitiveness and secure higher levels of investment. [60] With both programmes running concurrently up to 2017, the amendment to Section 12I would avoid periods where there is no incentive available for larger investors.

5.2 Qualifying Criteria and Workings

In order to qualify as an 'industrial project', a project must be solely or mainly concerned with the manufacturing of products, articles or other things as classified under 'Section C: Manufacturing' of the Standard Industrial Classification Code (the SIC Code) issued by Statistics South Africa.[61] Each project must have a minimum asset holding.

55 National Treasury (2008:82).

56 National Treasury (2015:35).

57 (ibid.).

58 Per the Taxation Laws Amendment Act No. 25 of 2015, promulgated on 8 January 2016.

59 For a complete list of incentives offered by the DTI, see https://www.thedti.gov.za/financial_assistance/financial_assistance.jsp, last accessed 27 November 2015).

60 For more information, see https://www.thedti.gov.za/financial_assistance/financial_incentive.jsp?id=53&subthemeid=25, last accessed 27 November 2015. On 28 October 2015, the DTI suspended new applications for the MCEP, owing to the large number of applications which had exceeded the allocated funds.

61 See definition of 'industrial project' in Section 12I(1). Projects for the manufacturing of, for example, wine and biofuels are specifically excluded.

For greenfield projects, the minimum asset holding should exceed R50 million. For brownfield projects, the asset holding must exceed the higher of 25% of the cost of pre-existing assets (limited to R50 million) or R30 million. The purpose of these thresholds is to ensure that the projects that benefit from this incentive will provide a substantial benefit to the economy.[62]

Typically, plant and machinery which are used in manufacturing would qualify for a capital allowance under Section 12C of the Income Tax Act. Manufacturing buildings qualify for an allowance at a rate of 5% per annum.[63] Section 12I thus provides for a once-off additional investment allowance over and above the other available capital allowances.

The qualification for the Industrial Policy Project Programme is largely based on a point-scoring system as contained in the regulations. In order to qualify for the incentive, the taxpayer must meet the regulatory criteria as reviewed by an adjudication committee constituted in terms of Section 12I. The minister of Trade and Industry must also be satisfied that the project satisfies the minimum criteria.[64]

According to the point-scoring system, an Industrial Policy Project will achieve ‘qualifying status’ if it scores at least five out of a total of 10 points and ‘preferred status’ if it scores at least eight out of a total of 10 points. As regards the criteria of improved energy efficiency and cleaner production technology, two points are available.[65]

Where the industrial policy project is approved with preferred status, the allowance is determined as follows:

- 55% of the cost of the new and unused manufacturing asset; or
- 100% of the cost of any new and unused manufacturing asset located within an industrial development zone.[66]

The allowance is claimed in the year that the asset is brought into use, limited to a total deduction of R900 million per project for greenfield projects and R550 million per project for brownfield projects over the lifespan of the project.

Where the industrial policy project is approved with qualifying status, the allowance is determined as follows:

- 35% of the cost of the new and unused manufacturing asset; or
- 75% of the cost of any new and unused manufacturing asset located within an industrial development zone.[67]

62 National Treasury (2008:83).
63 Per Section 13 of the Income Tax Act.
64 The requirements are listed in Section 12I(7).
65 As determined by Section 12I(8)(a).
66 From the date on which the Special Economic Zones Act No. 26 of 2014 comes into operation, the 100% allowance will be granted only for manufacturing assets located in a special economic zone.
67 From the date on which the Special Economic Zones Act No. 26 of 2014 comes into

The allowance is claimed in the year that the asset is brought into use, limited to a total deduction of R550 million per project for greenfield projects and R350 million per project for brownfield projects over the lifespan of the project.

As was the case with the Section 12B allowance (see paragraph 3 above), if the taxpayer leases the asset and undertakes obligatory improvements in terms of a public-private partnership (or for obligations incurred on or after 1 January 2013), the IPPPP will apply. Therefore, if the lessee uses the asset for purposes of earning income, depreciation will be allowed on those improvements as if the lessee owned the asset directly.[68]

Example illustrating the workings of the Section 12I allowance[69]

Hypothetical case: A taxpayer whose greenfield project qualifies for preferred status purchases machinery for R300 million. The machinery qualifies for the Section 12C capital allowance.

Results: In the year that the machinery is brought into use, a Section 12C deduction of R120 million (R300 million x 40%) will be allowed. In addition, a Section 12I allowance of R165 million (R300 million x 55%) can be claimed. In each of the following three years, further Section 12C deductions of R60 million (R300 million x 20%) per year will be allowed. Note that the Section 12I allowance is only available in the first year.

Lastly, approval can be withdrawn should the benefiting taxpayer not comply with the various regulations. Withdrawal of the benefit triggers significant penalties by way of additional taxes.[70]

6 Special Economic Zones – Section 12R

In an effort to reposition itself in the world economy, the government established the Industrial Development Zones (IDZ) Programme in 2007. Its main focus was to attract foreign direct investment and to stimulate the export of value-added commodities. Some weaknesses in the programme led to a policy review and the introduction of a new Special Economic Zones (SEZ) policy in 2010.

SEZs are geographically designated areas of a country set aside for specifically targeted economic activities, supported through special arrangements and support systems that

operation, the 75% allowance will be granted only for manufacturing assets located in a special economic zone.

68 For the purposes of the Section 12I allowance, the improvements will be deemed to be a new and unused manufacturing asset. Also, the expenditure incurred by the lessee to complete the improvements will be deemed to be the cost to the lessee of the new and unused manufacturing asset.

69 National Treasury (2008:84).

70 The penalties are determined in terms of the Tax Administration Act No. 28 of 2011.

are often different from those that apply in the rest of the country.[71] For tax purposes, the definition of an SEZ as used in the Special Economic Zones Act applies.[72]

From a date still to be announced, the new Section 12R incentive will come into effect. It will apply to a South African incorporated company which has its place of effective management in South Africa and carries on business in an SEZ. The company must carry on business or provide services from a fixed place of business situated within an SEZ. Furthermore, the company must derive at least 90% of its income from the carrying on of business or provision of services within one or more SEZs.[73]

An SEZ is an economic development tool to promote rapid economic growth by using support measures to attract foreign and domestic investments and technology. The support envisaged includes technology, research and development to ensure on-going technological innovation, environmental management plans and logistics support.[74]

A number of SEZ tax incentives will be available:[75]

- preferential 15% corporate tax (as opposed to the usual 28%);[76]
- accelerated capital allowance for buildings;[77]
- an employment tax incentive;[78]
- the Section 12L incentive for greenfield and brownfield investments; and
- tax relief as a result of being classified as a customs-controlled area.[79]

Notwithstanding a qualifying company being located in an SEZ, the reduced rate of 15% does not apply in respect of activities classified under 'Section C: Manufacturing' in the SIC Code.[80] The relief ceases to apply in respect of any year of assessment commencing on or after the later of 1 January 2024 or 10 years after the commencement of the carrying on of business in an SEZ.

71 Department of Trade and Industry (2012:13).

72 The Special Economic Zones Act No. 16 of 2014 was published in GG 37664 (dated 19 May 2014), but the date of commencement is yet to be proclaimed. The definition of an SEZ is in Section 1, read with Section 23(6).

73 Definition of 'qualifying company' in Section 12R(1).

74 Department of Trade and Industry (2012:13).

75 See http://www.thedti.gov.za/industrial_development/sez.jsp, last accessed 22 November 2015.

76 The requirements for qualifying for the reduced rate are contained in the definition of 'qualifying company' in Section 12R(1).

77 In terms of Section 12S of the Income Tax Act.

78 In terms of the Employment Tax Incentive Act No. 26 of 2013.

79 As per the Value-Added Tax Act No. 89 of 1991, the Customs and Excise Act No. 91 of 1964, the Customs Duty Act No. 30 of 2014 and the Customs Control Act No. 31 of 2014.

80 In terms of Section 12R(4), these activities are: distilling, rectifying and blending of spirits (SIC Code 1101); manufacture of wines (SIC Code 1102); manufacture of malt liquors and malt (SIC Code 103); manufacture of tobacco products (SIC Code 12); manufacture of weapons and ammunition (SIC Code 252); and manufacture of biofuels if such manufacture negatively impacts on food security in South Africa.

A laudable example of the development of the renewable energy sector in the context of SEZs, is the transformation of Atlantis into a green technology SEZ.[81] The GreenCape initiative has undertaken the project management on behalf of the DTI, the Western Cape Government and the City of Cape Town in the application for the designation of a GreenTech[82] SEZ in Atlantis.[83] This SEZ has the potential to create 2 500 direct jobs.[84]

7 Conclusion

A recently published joint report by the IEA and the Nuclear Energy Agency asserts that the cost of producing electricity from renewable sources like the wind and sun has been falling for several years.[85] Notwithstanding this fall in production costs, renewable energy still requires an enabling environment to become even more competitive relative to traditional energy sources. In its *White Paper on the Renewable Energy Policy,* government recognises that the development of fiscal, financial and legislative instruments will be required to stimulate the increased use of renewable energy technologies.[86]

This article has reviewed the fiscal incentives offered by the government to advance the uptake of renewable energy in South Africa. These include an allowance for energy efficiency savings (Section 12L), a capital allowance for machinery used in the production of renewable energy (Section 12B), exemption for CERs (Section 12K), an allowance for industrial policy projects (Section 12I), and a host of tax incentives for the proposed SEZs (Section 12R).

Environmental taxation has a significant role to play in addressing environmental challenges.[87] It is to be hoped that the South African government will continue its endeavours to develop renewable energy in South Africa through the effective use of environmental taxes and incentives.

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81 Atlantis is a town in the City of Cape Town Metropolitan Municipality and is located in the Western Cape. For more information regarding the incentives available for the Atlantis GreenTech SEZ, see http://greencape.co.za/news/atlantis-sez-/, last accessed 25 November 2015.

82 'Greentech' refers to low-carbon and resource-efficient technologies.

83 Established in 2010, the GreenCape non-profit organisation is a sector development agency that supports businesses operating within the green economy in the Western Cape. Its aim is to unlock the investment potential of green business, technologies and manufacturing, which in turn will contribute to improving resource efficiency, carbon intensity and the regional economy. Also see http://greencape.co.za/about-us/about-us/, last accessed 25 November 2015.

84 Ringwood (2015:28).

85 International Energy Agency (2015b).

86 Department of Minerals and Energy (2003:27).

87 OECD (2011:12).

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14.
BUSH ENCROACHMENT, DE-BUSHING AND ENERGY PRODUCTION IN NAMIBIA

Lydia Mlunga & Frank Gschwender

1 Bush Encroachment in Namibia

Namibia is challenged by massive bush encroachment that currently affects more than 26 million hectares of agricultural land.[1] The bush-encroached area constitutes more than 30% of the 829 000 km^2-large country and spans eight of its 13 regions, with a concentration on the central northern part of Namibia (see Figure 1). There is evidence that the process of bush encroachment has been triggered by man-made factors like overgrazing and prevention of natural fires. These factors distorted the natural savannah ecosystem and favoured the growth of woody vegetation, in particular 'intruder' bush, at the expense of grass vegetation.

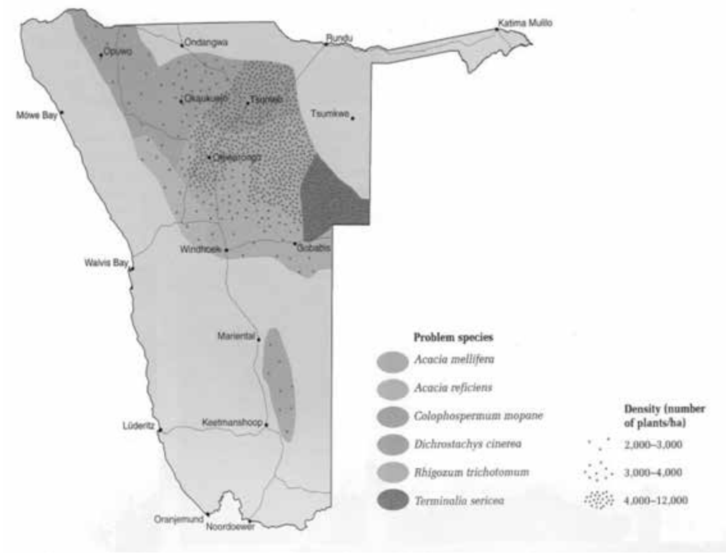

Figure 1. Areas and relative densities of bush encroachment in Namibia
Source: Bester (2010).

1 De Klerk (2004).

The phenomenon of bush encroachment severely degrades the rangeland and reduces its carrying capacity by up to two-thirds in Namibia. The degradation hampers meat production, leading to economic losses of more than 1,5 billion Namibian dollars per year.[2]

Bush-encroached Rangeland in the Grootfontein District

Mechanical bush harvesting

At the same time, measures to control bush encroachment create unique opportunities for the Namibian economy to consider the biomass as a resource that can be used in various industries. An obvious and promising solution is offered by the utilisation of the bush biomass for energy generation.

However, the current de-bushing efforts amount to only 0,5% of the total resource, or less than 10% of the annual re-growth. These figures illustrate that current response measures to de-bushing are rather insignificant. Thus, the inevitable increase of bush encroachment to the detriment of Namibian agriculture continues rapidly. Utilising encroacher bush would not only restore natural rangeland and its former productivity, but would also provide economic growth opportunities based on local resources and create employment opportunities along various value chains. Not least, it would provide a relevant contribution to the country's envisaged diversified energy mix.

2 The Use of Biomass in Electricity Generation

Local biomass can be used to generate power and to contribute to the future electrical energy mix of Namibia, by substituting coal in coal-fired power plants or by fuelling dedicated decentralised biomass power plants.

According to Von Oertzen,[3] 200 to 300 million tons of encroacher biomass stand on Namibian farmland today, an amount of which the annual re-growth alone would be sufficient to cater for the entire annual electrical energy demand of Namibia. A pre- feasibility study for biomass power plants in Namibia, conducted by the

2 STEAG Energy Services (2013).
3 von Oertzen (2014:5).

Namibian power utility NamPower, states that the re-growth of encroacher bush would allow for the operation of 45 20-megawatt (MW) plants, totalling a capacity that is 1,5 times today's national power consumption.[4] Nevertheless, there are no industrial-scale electricity generation activities based on biomass in Namibia today.

NamPower is looking into the possibilities of utilising biomass for power generation by means of co-combustion within its Van Eck coal power station in Windhoek. Sixty megawatts (half of its capacity) would generate a long-term biomass demand of 500 000 tons per annum, which would have a sizeable impact on de-bushing of Namibian farmland.

Another option that is being pursued by NamPower is the development of decentralised biomass power plants of 5 to 20-MW capacity, either as stand-alone plants or as hybrid plants with an additional concentrate solar power component. The latter would allow the use of biomass as base load and solar energy for peak load power generation. Interestingly, the biomass supply for a five- and 20-MW plant, respectively, could be sourced within a 25 to 35 km radius of bush-encroached farmland, excluding the re- growth potential. Harvesting technologies tested and applied in existing de-bushing operations can produce the yields that are required to supply such power plants.

Torrefied biomass pellets or bio-coal pellets are a new biomass product with long-term potential in local and international markets. Through its coal-like material properties and high energy density, it is most suited to complement or replace fossil coal in power stations. This technology, however, is still in its development stage and there is no immediate opportunity for bio-coal yet.[5]

In addition to the arguments mentioned above, the bush encroachment situation in Namibia can serve to meet a global demand for biomass with its ever-increasing interest in finding alternative, renewable and CO -neutral energy resources. The demand for wood pellets in coal-fired power plants, but also in private households in Europe, results in an increasing supply gap, which offers opportunities for future suppliers from source regions across the globe, including southern Africa.

3 The Use of Biomass in Industrial Boilers

The use of encroacher wood in industrial applications and boilers is still in its infancy in Namibia. Companies that started using biomass in their operations include the Ohorongo Cement Factory, which is situated near Otavi in the midst of a highly bush-encroached area. Ohorongo has a total wood demand of 85 000 tons per year and plans, at full capacity, for 75% of its energy needs to be met by wood biomass (and the remaining 25% by coal).[6] Ohorongo, through its subsidiary Energy for Future, is harvesting bush on neighbouring farmland and started in 2014 also to source 'third party wood' from service providers.

4 WSP Environment and Energy South Africa (2012).

5 STEAG Energy Services (2013).

6 Colin Christian & Associates cc (2010).

The Windhoek-based Namibia Breweries decided to exchange its heavy oil-fuelled boiler with a modern biomass boiler. The Breweries estimates to have a demand of 7 000 tons of wood biomass per year to co-fire its industrial beer-brewing boilers. The newly established SAB Miller brewery in Okahandja installed a fossil fuel boiler, but may consider the biomass option in future.

Other players in the food industry are also considering the potential of substituting fossil fuels with local biomass. Among others, the meat industry, and specifically MeatCo as the industry leader, is exploring options for future biomass utilisation in its industrial boilers at the abattoirs in Windhoek and Okahandja. Similar opportunities exist for the fish processing industry. However, its location in the Erongo region along the Atlantic coast is outside the bush-infested area, which would burden a potential biomass supply with considerable logistics costs.

4 Household Consumption

The *Namibia 2011 Population and Housing Census* reported that, more than 50% of Namibian households use wood energy for cooking and heating, totalling a consumption of 2 000 tons of woody biomass per day.[7] Specifically in urban and peri-urban environments, where firewood becomes a scarce commodity, the substitution by bush products bears considerable potential. That would at the same time counter the deforestation in such environments.

Charcoal production is well established in Namibia. Namibia produces up to 150 000 tons of charcoal annually (using 600 000 tons of wood per year).[8] Most of the charcoal is exported to South Africa and the remainder to Europe, namely to Great Britain and Germany. A recently conducted trade profile for Namibian charcoal identified a huge additional market potential: immediate market opportunities exceed current export volumes by a factor of 3 to 5, partly in markets in the Middle and Far East that pay considerably higher prices than the traditional markets. What is needed to exploit these opportunities is to upscale the harvesting operations significantly and to modernise processing operations through higher-productivity kilns.

In addition to firewood and charcoal, wood briquettes or logs from compressed bush material are produced locally with market opportunities in Namibia, neighbouring SADC countries, and overseas. However, with their limited application in private households and high logistics cost, the overall market potential is limited.

5 Support to De-bushing Project

The MAWF/*GIZ* Support to De-bushing Project is working in collaboration with the Directorate of Forestry within the Ministry of Agriculture, Water and Forestry (MAWF). It is part of the bilateral cooperation programme between the Federal

7 Namibia Statistics Agency (2011).

8 Rothauge (2014).

Republic of Germany and the Republic of Namibia, implemented by the *Gesellschaft für Internationale Zusammenarbeit* (*GIZ) GmbH*. The aim of the project is to develop a national de-bushing programme to substantially upscale current de-bushing efforts.

The focus of the programme is on developing opportunities to utilise the harvested bush. The absence of value addition opportunities has been identified as a main factor hampering previous efforts to initiate large-scale de-bushing programmes. The project places an emphasis on strengthening the biomass supply sector to allow for the upscaling of future harvesting operations. Project activities will focus on developing a biomass fuel supply concept that facilitates reliable and sustainable supply guarantees of large volumes. This will be complemented by the enhancement of both labour-based and mechanised harvesting methods and by streamlining policies and regulations to foster an enabling environment.

The overall objective of the project remains the restoration of productive rangeland and the increase in carrying capacity. Secondary benefits are employment creation, economic growth and improved energy supply.

6 Outlook for Namibian Biomass Energy

Bush encroachment constitutes a challenge, but also an immense opportunity for the Namibian economy at large. Bush as biomass resource and renewable fuel has the potential to contribute substantially to Namibian energy security, specifically through decentralised supply options. The challenge is to translate a problem into an opportunity and to create and utilise the dynamics resulting from such a paradigm shift.

Through the value addition approach, the MAWF/*GIZ* Support to De-bushing Project aims to develop a vision for the sector that pushes for the optimum utilisation of the bush resource for national benefits. The implementation requires a national concerted development effort involving both public and private stakeholders.

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SECTION IV:
ENERGY SECURITY AND ENERGY INSECURITY

15.
SUSTAINABLE, COST-EFFECTIVE AND ENVIRONMENTALLY SOUND ENERGY – A REFLECTION FROM ZIMBABWE

Eddie Cross

The Zambezi River basin offers an excellent example of how a major regional river system can be used to supply low-cost electrical energy to the countries through which the river flows. It rises in the Congo, just south of Kolwezi and then flows down through eastern Angola and north-western Zambia, and down the length of Zambia to Kazungula. Here the boundaries of Angola, Namibia, Zambia, Botswana and Zimbabwe touch briefly before the river is deflected by volcanic deposits of basalt rock towards the Victoria Falls.

After plunging nearly 100 metres into a spectacular gorge, the river then meanders across the African continent, flowing through the Kariba Dam, then through the middle Zambezi valley and into the Cahora Bassa Dam in Mozambique, and then finally running across the lower Zambezi flood plains to the Indian Ocean. To take its journey of over 2700 kilometres, the river rises at an altitude of about 1 400 metres above sea level. What makes the river particularly interesting is the fact that its main watershed, covering 85% of its flow volume, is located in a region that, while it is already subject to high levels of annual precipitation (in excess of a metre or more of rain each year), is expected to become even wetter as a result of global warming trends.

In Zambia, the upper reaches of the river run across flat, sandy plains that become flooded during the wet season, which runs from October through to April each year. In the middle section, just above Kazungula, the river forms the boundary of the Caprivi Strip (part of Namibia) and there the river overflows its banks and forms another great flood plain that drains into the Chobe River, which in turn runs back into the Zambezi just above Kazungula.

Because of these vast flood plains, much of the silt that the river contains as it leaves the highlands in the Congo and northern Zambia is deposited on the plains and feeds huge swathes of wetland grass and reed beds. It also means that the river must be one of the cleanest rivers in the world, and only the silt-laden waters of the rivers from Zimbabwe and Zambia (the Sanyati and the Luangwa, in the main) sully its character. The other major tributaries of the Kafue and the Shire share much of the character of the main river system.

In addition to the two major dams on the main river, the Kafue has a large dam constructed with associated hydro-electrical capacity. The existence of these dams (Kariba is 350 kilometres long and over 50 kilometres wide) and the natural water storage systems in Zambia and the Caprivi mean that the river flow below the Kariba Dam is pretty much regulated today. The dam itself has only spilled seven times in the 57-year life of the dam. This suggests that the installed hydro electrical capacity of 1 500 megawatts is pretty much all that the river flow can sustain.

Zambia has already installed another 300-megawatt power station on the north bank, and Zimbabwe is in the process of doing the same thing – but the objective is to allow the power stations to meet peaks in demand rather than sustained greater output. When complete, these two power stations will have a combined capacity of 2 100 megawatts. Built originally at a cost of 80 million pounds, Kariba was an act of faith and the largest civil engineering project in the world at the time. Today it generates 1 800 megawatts of power at a cost of below 2 US cents per kilowatt hour of totally clean, sustainable energy.

Cahora Bassa is even larger – also a concrete arch wall, with one power station on the south bank generating 4 000 megawatts. It has the potential to generate another 1 600 megawatts on the north bank, but more or less on the same premise as Kariba expansion – giving Mozambique capacity to meet peaks in demand and leaving thermal stations to feed the grid on a continuous basis.

These three major power plants can presently generate a total of 5 800 megawatts and have the potential to increase this output to 7 700 megawatts – with Kafue. The Zambezi River basin therefore has the capacity, with the possible expansions at Kariba south bank and Cahora Bassa north bank to generate over 8 000 megawatts of clean, sustainable energy at an average cost of about 4 cents per kilowatt hour.

Mozambique is planning a further dam and power plant below Cahora Bassa, and Zimbabwe and Zambia plan another hydro-electric dam in the Batoka Gorge below the Victoria Falls. These two new developments would push the total yield from the Zambezi basin to over 11 000 megawatts and provide the regional power grid with considerable flexibility in terms of its capacity to meet peak demands.

In the event that the two new dams are constructed on the main river, it is possible that the combined weight of stored water on the earth crust in the river basin will limit any further dam construction. However, at that point the river flow will be almost totally controlled except for exceptionally wet seasons when the river flow rises to unusual levels.

Global warming predictions are that the principle catchment areas in the river basin will be much wetter and also subject to greater extremes. This poses a threat to existing and planned infrastructure and calls dam stability into question. In the case of Kariba, the spillway consists of six gates in the wall, some 70 metres above the river level below the wall. When a gate is opened it spills into the river below the wall and creates considerable turbulence. In addition the process creates vibrations in the main wall.

Over the past 50 years this has created a pool some 150 metres deep and there is concern today that the process may undercut the foundations of the main wall. The World Bank is funding emergency work on the problem, which involves pumping thousands of tonnes of concrete into the rock formations below the wall and casting a slab of concrete on the side of the pool against the wall, while removing some 300 000 tonnes of rock downstream in the river bottom to allow water from the gates to exit from the pool with less turbulence.

The spillway in the Cahora Bassa Dam was designed to allow water from the bottom of the lake to leave the wall in a jet of water that takes the spillage over 100 metres below the wall and well away from its foundations.

The installation of additional capacity at Kariba and Cahora Bassa and of enhanced capacity in any future dams has the added benefit that an increase in precipitation over time will allow these power plants to run at capacity without reducing dam levels significantly. It will also strengthen the management of the river flow below the dams, although when all turbines are operating at capacity there will be some flooding of the lower Zambezi system.

An interesting possibility which has not been studied in any depth is the use of river flow technology to generate power from turbines installed in barrages on the river. These structures would not raise the river level significantly and therefore increase the total volume of water being retained in the basin, and could increase total power generation very significantly. The Shire River offers some potential of this sort.

What are the threats to the potential of the Zambezi River as a source of renewable energy? In my view, the threats are principally related to how the ecosystem that currently supports the nature of the river is managed, in particular, the management of the flood plains in Zambia and Namibia, and perhaps also on the Kafue, which are fragile and vulnerable to human settlement pressure and development. The hippo population is critical as these animals maintain the channels that drain the summer flood plain waters back into the main river system.

An examination of the wildlife along the whole length of the river shows that where the wildlife is properly protected, populations of both crocodiles and hippo are reaching high levels – in particular, the hippo populations are denuding the river banks of all vegetation and this makes the banks vulnerable to erosion. However, in areas where protection is less effective or nonexistent, the hippo have almost been shot out.

The second threat is urban demand for water in South Africa and to a lesser extent in countries like Zimbabwe and Botswana. All three countries are likely to become drier and there is already ample evidence of reduced inflows to dams in all three states. Gauteng will exhaust its available raw water supplies by 2020 and for many years has been contemplating the development, with Botswana and possibly Zimbabwe, of a water delivery system from the Zambezi to Gauteng.

Zimbabwe has already blocked a proposal by Botswana to draw water from the Chobe to support large-scale irrigation in the Pandamatenga area of northern Botswana. Conflicts over water are likely to become much more problematical and the recent formation of the Zambezi River Authority with its headquarters in Harare is a big step forward.

The great advantage of the use of river flow to generate sustainable, clean energy at a low price is that it does not interfere with the flow of the river itself. In the USA many major rivers reach the ocean as a small remnant of what they are inland. There will be room for offtake for other uses in the region but any such abstraction will require substantial research and planning as well as difficult regional negotiations between states holding riparian rights.

Looking further north to the Congo River basin, it is clear that this has ten times the potential of the Zambezi and must ultimately be developed by the region. This in turn points to the need to strengthen and extend the operations of the Central African Power Pool in Harare to allow the efficient and cost-effective distribution and management of regional power resources. The Zambezi River basin shows that where states pit their own needs against those of their neighbours and look at the energy sector as an export industry, the exploitation of the massive hydro-electrical capacity of major regional river systems is possible.

The pursuit of self-sufficiency of states like South Africa by using more expensive and polluting coal-based technologies has considerable downside risks and problems. These are all too visible today in South Africa where load shedding is forcing the country to use diesel plants to meet peaks in demand. Developing a globally competitive economy is critically dependent on the availability of cheap, clean, sustainable electrical energy. The Zambezi River system shows how it can be done.

16. WILL SOUTH AFRICA CHOOSE NUCLEAR ENERGY AS ITS FUTURE? A CHANGE OF NUCLEAR POWER CLIENTELE – BRICS INSTEAD OF OECD?

Maren Gebel

1 Introduction

Worldwide many countries are switching off their nuclear power plants and are searching for alternatives to supply sufficient energy. South Africa, however, is planning to expand atomic energy. In future, an additional 9,6 GW are to be generated from atomic energy. South Africa, as a threshold country[1], must deal with the increasing demand emanating from industry and the population for affordable electricity, and at the same time the country wishes to meet its self-imposed targets of minimising CO_2 emissions resulting from electricity production. It is thus faced with the great task of planning its energy future in a sustainable, cost-efficient and CO_2-efficient manner in order to maintain and strengthen its competitiveness. One possibility to achieve this is the expansion of the nuclear power programme. This process is already in full swing in South Africa. How transparent is the planning of the construction of new South African nuclear power plants? What influence does German energy reform have in comparison with the influence of nuclear expansion programmes of the BRICS[2] states on the decision-taking process in South Africa? And finally, is the legal framework being considered and adhered to in the plan to construct further nuclear power plants?

South Africa currently has the only nuclear power plant on the African continent – namely Koeberg 1 and 2.[3] The power plant lies to the north of Cape Town and was completed in 1984/1985[4] by the French manufacturer Framatome (today Areva). Since then it produces approximately 5% of South African electricity and thus provides for about 50% of the energy demand of the Western Cape Province.[5]

1 Countries with emerging economies.
2 Association of threshold countries: Brazil, Russia, India, China and South Africa.
3 Stott (2013:15).
4 (ibid.).
5 Stott (2013:16).

However, the South African energy market is undergoing significant change. Since South Africa is a country rich in resources such as coal, energy production was based largely on coal. Coal could be extracted cost-efficiently and thus the price of energy production was also low. In addition, South Africa has natural uranium deposits that constitute 1,1% of global uranium production.[6] Thus, South Africa would be able to resort to its own resources when producing nuclear power. With its 2008 White Paper,[7] South Africa committed itself to a reduction of CO_2 emissions as its contribution to avoid climate change. The Integrated Resource Plan (IRP) that was compiled in 2010 constitutes an investment plan for an energy mix (coal, gas, renewable energies and nuclear energy)[8] from various energy sources that is successively to reduce CO_2 emissions from coal power plants and that is to cover the increasing energy demand.[9]

South Africa frequently suffers from energy bottlenecks. Eskom, the state enterprise that is responsible for most of South Africa's energy supply, cannot guarantee continuous energy supply. Eskom provides not only South Africa with energy, but also its neighbouring countries. Indeed, South Africa produces 50% of African electricity.[10]

Because of a lack of energy during peak hours, power failures occur frequently: in 2008 'rolling blackouts' occurred and the electricity grid was on the verge of collapse because Eskom simply could not meet the electricity demand.[11] In order to deal with this electricity uncertainty, private households and also small enterprises have resorted to acquiring emergency generators that can be switched on in the event of power failures. The use of private generators is well known in other parts in Africa, but comes as somewhat of a surprise in South Africa. Since 2008 the energy supply was stabilised through energy-saving measures, but when problems are experienced in the coal power plants, blackouts still occur. For example, damage to a coal-storage silo at the Majuba Power Plant led to power failures in Johannesburg in November 2014.[12] In order to avoid widespread power failures, Eskom is practising so-called load shedding. Energy supply to entire suburbs is switched off throughout the country at scheduled times in order to reduce energy demand.

2 The Construction of New Nuclear Power Plants – More Haste, Less Speed

In order to meet the energy demand, South Africa is considering an increase in the number of its nuclear power plants. To date, South Africa has been circumspect about expanding its nuclear power supply.

6 IEA (2014:60).

7 A White Paper outlines the government's intentions, but has no binding effect.

8 Republic of South Africa, Department of Energy (2014d).

9 Eberhard (2012:slide 22).

10 IEA (2014b:5).

11 Kumwenda-Mtambo (2014).

12 Thomson Reuters (2014).

In 2011 the Integrated Resource Plan (IRP) was passed. It analyses, provides reasons for, and regularly updates the energy future planned by the Department of Energy to be in line with the current situation.[13] In 2010 it was planned to generate 9,6 GW of electricity from nuclear energy by 2030.[14] In the subsequent evaluation (published in November 2013), this expansion was put on hold for the time being on the grounds of the high costs, possible alternatives and the energy demand being lower than expected.[15]

The extent to which South Africa took small and well-contemplated steps towards an expansion of its nuclear programme can be seen from the fact that it had an Integrated Nuclear Infrastructure Review (INIR) done by the International Atomic Energy Agency (IAEA) in February 2013. South Africa did so as the first country with an existing nuclear power plants. For the purposes of this review, the IAEA, with the assistance of independent experts, evaluates the situation in the country on the basis of 19 points and establishes to what extent nuclear power is an option.[16] To date, the report by the IAEA, which has been made available to government, has not been published.

In 2014, the speed of planning for the nuclear power plants was suddenly stepped up. In February, South Africa obtained information from its BRICS[17] partner, China, on the construction of nuclear power plants.[18] From September onward, intergovernmental agreements were concluded with Russia, France and China with regard to consulting and possible cooperation during the construction of nuclear power plants with a capacity of 9,6 GW.[19] From October, so-called Nuclear Vendor Parade Workshops followed with Russia and France during which the respective countries could present their capacities and their ideas with regard to cooperation in the area of nuclear energy.[20]

Up to the end of the year 2014 such agreements were also concluded with the other nuclear energy countries (South Korea, USA and Japan) and similar workshops are to be held with these countries.[21]

It is not clear whether South Africa has deviated from the recommendation of the IRP or whether the IAEA has recommended an expansion of the existing nuclear system. The plans for the expansions of the nuclear power plant programme may be due to political reasons (cooperation with China and Russia) or due to economic reasons on the grounds of a lack of alternatives. It needs to be clarified to what extent the costs can be carried by the South African state and thus by the taxpayers.

13 Republic of South Africa, Department of Energy (2013:10).
14 See Republic of South Africa, Department of Energy (2013:12ff.).
15 Republic of South Africa, Department of Energy (2013:8).
16 IAEA (2014).
17 Association of threshold countries: Brazil, Russia, India, China and South Africa.
18 Republic of South Africa, Department of Energy (2014a).
19 Republic of South Africa, Department of Energy (2014b, d and g).
20 Republic of South Africa, Department of Energy (2014d and e).
21 Republic of South Africa, Department of Energy (2014f.).

3 Constitutional Allocation of Tender

As mentioned in Section 2, South Africa is negotiating with different states on possible new nuclear power plants in spite of the IRP recommendation. On 1 October 2014, the Department of Energy issued a media release on the occasion of launching South Africa´s Nuclear New Build Programme which explains the objectives and the approach of the tender process in detail.

Through the expansion, the Department wishes to achieve the following:

- energy security/stability;
- reduction of CO_2 emissions;
- increased economic growth;
- creation of jobs; and
- attraction of more investors.[22]

These objectives are plausible. However, procurement process guidelines, as laid down in constitutional law, have yet to be taken into account.

Even if there is currently no particular act governing the procurement process for nuclear power plants, the Department of Energy is bound by the five constitutional principles with regard to the allocation of tenders. In section 217 of the South African Constitution the procurement process is described as having to be "fair, equitable, transparent, competitive and cost-effective".

These principles constitute a complementary system in which every individual aspect must be taken into consideration independently and in which the individual aspects cannot be applied randomly. Adherence to these principles guarantees the integrity of the tender process.[23]

In this regard, it is particularly remarkable that the Department of Energy emphasises in the above-mentioned media release that the procurement guidelines must be adhered to. In fact, in the media release, the government "undertakes" to adhere to a "fair, competitive and cost-effective" approach with regard to the procurement process.[24] It thus only upholds three of the five principles. Transparency and equitableness are not mentioned.

'Equitable' essentially denotes fairness that places particular emphasis on the equal rights and equal value of all. This principle must be seen against the background of apartheid, which thus implies that it should serve to strengthen the previously weak, disadvantaged groups in the state. For this reason South Africa has developed the concept of preferential procurement.[25]

22 Republic of South Africa, Department of Energy (2014c).
23 Bolton (2007:13f.).
24 Republic of South Africa, Department of Energy (2014c).
25 Bolton (2007:53).

The question is whether, and how, the strengthening of black population groups will be taken into consideration in the planning of new nuclear power plants. To what extent will jobs be created for the previously disadvantaged, since nuclear power plants mainly require qualified workers? In this respect it must also be asked whether the construction of the nuclear power plants will generate new jobs for South Africans.

Transparency requires that the public be granted access to general information and the selection criteria.[26] This is important to allow interested or affected persons the opportunity of gaining information on the procurement process, so that they may verify its lawfulness and take the necessary legal steps in the event of illegal conduct.[27]

The Department of Energy is not acting transparently in this case: access to information is difficult, helpful explanations and documents are only issued selectively, and different institutions provide contradictory information. These are not characteristics of a transparent process – neither for the citizens nor for parliament and the other government departments.

In planning the new nuclear power plant, three particular ministries should be involved from the beginning: the Department of Finance, the Department of Energy and finally the Department of Public Enterprises, since the state-owned energy company (Eskom) falls under the latter. However, the Vendor Parade Workshops are held only for the Department of Energy. The other two departments are excluded from the planning processes although they clearly should have a particular interest in the transparency of the procedure.

Finally, it is not clear, in the decision-taking process, whether cost-effectiveness is sufficiently considered. This principle implies that cost utilisation must be taken into account.[28]

The lack of transparency is partially justified by the need to protect the intellectual property of the respective states. However, in this case it is not a matter of making information on technologies available, but rather on costs and possible opportunities for South Africa (e.g. job creation). An open approach to the costs would also foster competitiveness, because it would then be attempted to underbid the competitors through lower offers. The underlying idea of the procurement law is to ensure that tax monies are used prudently.

Also, nuclear energy as an option of cost-effective utilisation should be compared with possible alternatives, as specified by the IRP. Other energy sources exist and could replace nuclear energy with more cost-effective and efficient options, for example gas.

It is unclear what costs would arise for South Africa with the new build programme. The budget also still seems to be under evaluation.[29] To what extent the respective

26 (ibid.:54).

27 (ibid.).

28 (ibid.:43).

29 See National Assembly Question 1928 to the Minster of Energy of 2014, available at http://www.energy.gov.za/PQS/2014/na/NA_1928.pdf, last accessed 6 February 2014.

nuclear power plant partner will be giving financial support to the South African nuclear construction programme through so-called funding is also not clear.[30] In particular, experts warn that the costs of final storage and later disposal must be taken into consideration because these two cost points have not been clarified globally thus far.[31]

4 Effects of German Energy Reform on the Nuclear Decision-taking Process

On the grounds of climate change and the associated state objective of minimising CO emissions, nuclear energy came to be considered a feasible option again in the first years of the new millennium – however, always depending on the public perception in the light of disasters beyond all expectations and the danger of terrorism.[32]

The nuclear disaster of Fukushima of 11 March 2011 led the Western world to reconsider its attitude towards nuclear energy. Germany decided to implement energy reform that would lead to the abolition of nuclear energy by 2022.[33]

Germany is not the only state to turn its back on atomic energy. This is shown by the World Energy Outlook of the International Energy Agency (IEA). Atomic energy peaked in the 1990s when it constituted 18% of worldwide energy production.[34] So far the Organization for Economic Co-operation and Development (OECD) states were the main clientele of atomic energy and produced up to 80% of the world's nuclear electricity.[35] In the meantime, many OECD countries have decided against an expansion of their nuclear power programmes and for the investment in other possible CO -efficient energy sources. With Russia, India, South Korea and China, nuclear power has found very important new and old supporters that eagerly want to expand.[36] With the exception of South Africa and Brazil, three out of five of the BRICS states are building on a future with CO -free energy production. So, while the majority of OECD countries are contemplating the still unresolved questions of cost-efficient and safe dismantling of nuclear power plants,[37] as well as the final storage of nuclear waste, some of the BRICS states are planning the construction of new power plants and ignoring the unresolved questions of nuclear energy. Thus it comes as no surprise that South Africa's first port

30 For example, the intergovernmental agreement with Russia opens the door to Russian funding. See Republic of South Africa, Department of Energy (2014b).

31 As stated, for example, in an interview with Prof. Dr. Oliver Ruppel, who lectures in the Faculty of Law at the University of Stellenbosch and is an expert in environmental law, in particular with regard to climate change.

32 Zillmann et al. (2008:336f.).

33 See Bill by the Federal Government on the 13. Act on the Amendment of the Nuclear Act, available at http://dip21.bundestag.de/dip21/btd/17/062/1706246.pdf, last accessed 6 February 2015.

34 IEA (2014b:4).

35 (ibid.).

36 (ibid.).

37 Balser (2014).

of call with regard to the construction of a nuclear power plant was China in February 2014.[38] With regard to its energy future, South Africa is obviously guided by its partners within BRICS.

5 Conclusion

South Africa is heading for a nuclear energy future. The German route of a mainly ethics-based renunciation of nuclear power seems to have little appeal.

It must be pointed out, however, that the question of an ethically justifiable energy source cannot be prioritised by every state in the manner in which it has been done in Germany. In South Africa, large sections of the population are living in poverty and are thus facing problems more immediate than the possibility of nuclear radiation.

The decision-taking process must, however, be questioned critically on three points. The decision is taken behind closed doors. Neither South African taxpayers nor important government members have the opportunity of participating in the process. The significant lack of transparency leads to questions about whether the government is taking the best possible decision for the people. The impression is created that information is only made available openly if this is in the best interest of the Department of Energy. Would it now not be the perfect time (almost two years after the inspection) to publish the report by the INIR of the IAEA to show the opponents of nuclear power that the International Atomic Energy Agency confirms that South Africa is capable of expanding its nuclear grid? Not to publish this report creates doubts about whether the IAEA has indeed made a positive finding.

Another point is that of funding. The Department of Energy would have to enter the negotiations with a concrete idea of what South Africa can afford. The budget should have been drawn up and should not continue to be in the process of being drafted. It also seems that hopes exist about the possible ‘sponsoring’ by a partner in order to cover the funding. Such sponsoring could, however, lead to unwanted dependencies. With regard to financing, a long-term perspective should be adopted that also takes into consideration the consequential costs that other forms of energy, for example natural gas, do not have. Only then can a responsible decision be taken with regard to the spending of taxpayers’ money.

Finally, the constitution forms a fundamental part of the South African state. The South African Constitution is comprehensive and progressive. Such progressive ideas should, however, also be applied in the political culture and should not only exist on paper.

Thus it does appear that the decision in favour of nuclear energy is based mainly on international relations, particularly with BRICS states. The danger of creating financial and possibly even economic dependencies on the donor countries should not be underestimated.

38 Republic of South Africa, Department of Energy (2014a).

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17. ENERGY INSECURITY IN AN ERA OF FOSSIL FUEL ABUNDANCE: THE UNITED STATES EXPERIENCE WITH HYDRAULIC FRACTURING FOR UNCONVENTIONAL GAS

Melissa Powers

1 Introduction

As energy experts around the world know, the United States (US) has witnessed an enormous increase in natural gas production since the early 2000s, thanks to improvements in hydraulic fracturing and horizontal drilling technologies.[1] This boom in unconventional natural gas production[2] has been credited with enabling a transition away from coal-based electricity, lowering US greenhouse gas emissions; promoting a rebirth of US manufacturing, supporting a transition to renewable energy resources and ensuring low-cost, long-term energy independence and security. Inspired by these purported results, many other governments of the world have begun to use or consider using hydraulic fracturing ('fracking') and related technologies to create their own domestic natural gas booms. After all, if the United States can benefit from a low-cost, environmentally friendly source of energy, why shouldn't the rest of the world?

Before other countries actively begin to pursue their own hydraulic fracturing practices, however, it would be wise to evaluate three critical aspects: the methods that the United States pursued to create its own natural gas boom; the legitimacy of the claims

1 Fitzgerald (2013). Hydraulic fracturing itself is not a new process; it has existed for nearly seven decades. The natural gas boom has instead resulted from a combination of hydraulic fracturing and horizontal drilling, along with the development of chemical mixtures and the use of 'proppants' to hold underground fractures open. Yergin (2011:325–332) describes how an independent driller, George Mitchell, perfected the process of extracting natural gas from shale.

2 'Unconventional' resources refer to oil and natural gas found within "shales, relatively im- permeable sandstones, and coal beds" (Fitzgerald, 2013:1338). In contrast to conventional resources, which have migrated out of the rocks and into other formations (typically called reservoirs), unconventional resources remain embedded in the source rocks.

made about natural gas as a reliable, low-cost, and environmentally friendly fuel; and the current status of the US natural gas industry. This article therefore examines the development and growth of the natural gas industry, and considers whether the promises uttered regarding the potential of the natural gas boom have been or will be fulfilled. Ultimately, the article argues that the US natural gas boom should serve as a cautionary tale – rather than a model – for other countries.

To reach this conclusion, section 2 and 3 explore the rise and potential decline of the natural gas industry. Section 2 of this article first describes the rise in US natural gas production by examining how the natural gas industry expanded production by relying on a combination of entrepreneurial effort, existing infrastructure and regulatory systems, subsidisation, exemptions from federal environmental laws, and positive spin regarding the economic and environmental benefits of natural gas. Next, section 3 of the article discusses the ongoing and increasing pushback against the use of hydraulic fracturing in the natural gas industry. As this section describes, opposition to hydraulic fracturing has increased on multiple fronts. For example, scientists have questioned the environmental benefits of natural gas, noting that their studies suggest that the life cycle emissions of greenhouse gases may exceed those of coal. Scientists have also produced reports linking hazardous air pollution and earthquakes to hydraulic fracturing operations. Concerned about these and other environmental impacts and generally unable to use federal law to address these concerns, several local communities and some political leaders have opposed hydraulic fracturing, often turning to state and local initiatives to ban hydraulic fracturing entirely. Perhaps more troubling for the industry, analysts have also questioned whether natural gas will remain a cheap fuel for much longer and suggest that the natural gas boom may actually have been an unsustainable bubble.[3] Section 3 concludes with a brief discussion of the potential consequences of a natural gas bust.

Section 4 then provides some concluding remarks about how other countries should view the US experience with natural gas.

2 The Natural Gas Boom

In the early 2000s, the United States began rapidly to expand its natural gas extraction and use. After decades of research, natural gas drillers finally had access to hydraulic fracturing and horizontal drilling technologies that would allow them to produce shale gas – pockets of natural gas that occur in rock formations – that would not otherwise have been economically viable to exploit.[4] With these technologies in place, the natural gas industry was allowed to take advantage of existing infrastructure to bring their gas to the market.[5] The gas industry realised, however, that hydraulic fracturing would require

3 See Horn (2013); Hughes (2014).

4 Yergin (2011:325–332) describes how an independent driller, George Mitchell, perfected the process of extracting natural gas from shale.

5 Merrill (2013: 977–981).

– and contaminate – large quantities of water, of which the treatment and disposal would be complicated and costly under existing environmental laws. To avoid these costs, the industry sought and received exemptions from key federal environmental statutes and thus was able to begin expansive hydraulic fracturing operations with little environmental oversight.[6] To its further advantage, the expansion of natural gas production coincided with increasing opposition to coal-based power production. Natural gas proponents successfully argued that natural gas would serve as a much cleaner, yet affordable, energy resource. Collectively, as this section will explore, these elements resulted in a natural gas boom in the United States.

2.1 Prerequisites to the Boom: Technology Development and Existing Infrastructure

Although natural gas exploitation goes back decades, the modern boom began in earnest in 1998, when an independent natural gas driller perfected the practice of extracting unconventional gas.[7] This driller figured out the right mix of fracking chemicals and proppants that would make hydraulic fracturing and horizontal drilling effective.[8] Soon after his discovery, natural gas and oil companies followed his lead and later adapted his process. The practice spread from the Barnett Shale in Texas and Oklahoma to the northeastern Marcellus Shale in Pennsylvania and Ohio, the Bakken Shale in North Dakota, and various oil and gas reserves in the Rocky Mountain states. Natural gas production increased rapidly in these regions.[9]

Analysts and legal scholars have identified a number of factors that contributed to the development of fracking technology and the ensuing boom. Although they may debate the importance of each factor, they generally agree that a number of conditions made the United States an optimal location for the fracking boom.

Government subsidies supported the research and development into fracking and horizontal drilling. According to the Breakthrough Institute, a US think tank, subsidies provided critical and direct support for technological developments.[10] Professor Thomas Merrill argues that the subsidies were less significant,[11] but nonetheless acknowledges that a tax credit available to producers was necessary to encourage unconventional gas production.[12] While parties may debate the extent to which subsidies supported the initial development of the fracking and drilling technologies, it is widely accepted that government support contributed to the unconventional gas extraction boom.

6 See infra notes 12–19 and accompanying text.
7 Yergin (2011:325–328).
8 (ibid.).
9 See Jackson et al. (2014:329), who notes that daily production of natural gas increased from 30 million cubic feet in 2005 to more than 700 million cubic feet in 2012.
10 Trembath et al. (2012).
11 Merrill (2013:976).
12 (ibid.:976–977).

Once the technologies were in place, the industry was able to take advantage of the existing legal and physical system that had already developed through a century of natural gas production in the United States. The US legal system allows private ownership of mineral resources; and it vests most regulatory authority over natural gas production in the states. These two factors have allowed developers to negotiate leases with private parties – thereby bypassing the often cumbersome leasing processes that apply to federally owned mineral rights – and to prioritise production in states with relatively lax environmental laws.[13] Whether one views these factors as a positive reflection of different risk appetites[14] or a classic example of the 'race to the bottom', it is likely that the legal system contributed to the natural gas boom.[15] The existing infrastructure – combined with another aspect of natural gas regulation – further supported the boom. Specifically, thanks to open access laws, unconventional gas producers were able to use the existing natural gas pipeline infrastructure to deliver their gas to market, and thus avoided the substantial capital outlay associated with building new gas pipelines.[16]

It is likely that unconventional gas production would not have developed as quickly as it did under different conditions. Without government support, unconventional gas production would probably have been too expensive and risky to pursue. Without private mineral ownership, natural gas producers would have faced greater scrutiny at the outset regarding the environmental impacts and economic viability of their production. And finally, without existing pipelines, the initial costs may have been too high to justify the risks involved in unconventional gas extraction. This combination of factors may be unique to the United States, which may explain why fracking is just beginning in other parts of the world. Yet even with these ample advantages, natural gas producers asked for more.

2.2 Environmental Exemptions

Once the natural gas boom began, natural gas producers sought further government support in the form of categorical exemptions from many key US environmental laws. In 2005, their wishes were granted through the Energy Policy Act of 2005, a piece of legislation derisively known as the Halliburton Loophole.[17] Through this loophole,

> Section 322 of the Act exempts hydraulic fracturing from the [Safe Drinking Water Act], which protects public and municipal water supplies from underground injection and disposal of hazardous substances through imposition of water quality standards. Further, the Act effectively exempted wellpad construction activities associated with hydrofracking from the National Pollutant Discharge Elimination System (NPDES) under the [Clean

13 (ibid.:977–981).
14 (ibid.:978–980).
15 (ibid.:977–981).
16 (ibid.:980), citing 18 C.F.R. pt. 284 (2012).
17 Energy Policy Act of 2005, Pub. L. No. 109–58, 119 Stat. 594, 694 (2005) (codified as amended in scattered sections throughout the US Code); Powers (2011:939).

> Water Act]. In addition, because Congress rolled hydrofracking-related practices into its exemption language, it potentially expanded existing oil and gas exemptions in [the Comprehensive Environmental Response, Compensation, and Liability Act] to aspects of site construction, drilling, and postfracking production. The Act also weakened review under the National Environmental Policy Act (NEPA) by presuming that certain categorical exclusions apply for oil and gas extraction. Hydrofracking is also exempt from [the Resource Conservation and Recovery Act], which provides for federal oversight of storage and disposal of hazardous materials, and from toxic substance reporting requirements under [the Emergency Planning and Community Right to Know Act].[18]

According to a *Los Angeles Times* investigation, the exemptions – or at least the exemption from the Safe Drinking Water Act – were meant to ensure swift production of natural gas through fracked wells.[19] Legislative history further shows that Congress viewed the exemptions as necessary to expedite the fracking process and promote energy security.[20] In other words, the exemptions from federal laws were key components to enabling a natural gas boom.

Once operations began, the natural gas industry sought further exemptions from various environmental laws that still applied to natural gas extraction. For example, as concerns about underground contamination of drinking water began to rise, private citizens and environmental organisations began to call for disclosure of the chemicals used in fracking fluids. Many natural gas companies resisted these disclosures, however, arguing that the information included protected trade secrets.[21] Although several states passed laws requiring some level of disclosure regarding the chemicals in fracking fluid, they often exempted companies from disclosing trade secrets.[22] Thus, the disclosures that companies produce today are likely to fail to report all chemicals used in the fracking process.[23] Natural gas producers have also resisted efforts by the Environmental Protection Agency (EPA) to regulate emissions under the Clean Air Act,[24] and they have successfully lobbied for federal legislation prohibiting a federal wildlife agency from expending resources on the protection of two species of sage grouse, at-risk birds whose habitats coincide with oil and gas drilling sites.[25] Indeed, federal and state efforts to regulate the environmental consequences of unconventional gas extraction have frequently faced opposition from the natural gas industry. The resulting lack of

18 Powers (2011:939–940).

19 Hamburger & Miller (2004).

20 H.R. Rep. No. 109–190, at 1 (2005), *reprinted in* 2005 U.S.C.C.A.N. 448, 448 (indicating the exemptions aimed “to ensure jobs for our future with secure, affordable, and reliable energy”.).

21 Rawlins (2013: 253–254).

22 Haas et al. (2012); Polley (2013).

23 Polley (2013:265).

24 *See* Summit Petroleum Corp. v EPA, 690 F.3d 733 (6th Cir. 2012); *National Environmental Development Association's Clean Air Project v EPA*, No. 13-1035 (D.C. Cir. May 30, 2014).

25 Valentine (2014).

environmental regulation has enabled the industry to grow rapidly and avoid compliance costs that many other industries must pay.

2.3 The Positive Propaganda: The Natural Gas Bridge

A final contributor to the natural gas boom has been the exceptionally positive image that the natural gas industry has cultivated – often with the help of environmental organisations – of natural gas as an environmentally friendly fuel. In the early 2000s, as the natural gas boom was gathering steam, a number of US environmental groups initiated a campaign to oppose efforts to build approximately 100 new coal-fired power plants across the United States.[26] As part of their efforts to stop the so-called 'coal rush', many environmental organisations began promoting natural gas as an environmentally superior fuel to coal.[27] Their support of natural gas focused on the fact that, in comparison to coal, natural gas combustion produces 50 to 60% of the greenhouse gases[28] and only a small fraction of other pollutants. Soon, advocates of natural gas began promoting natural gas as a 'bridge fuel' that would enable a transition from dirty coal to renewable power.[29]

The idea of a natural gas bridge quickly took hold and expanded as unconventional gas production ramped up. Natural gas advocates, for example, argued that natural gas would provide critical backup power for intermittent renewables.[30] Advocates also noted that the lower costs of building natural gas plants and of the natural gas itself would allow utilities and utility regulators to scrap newly constructed natural gas plants easily, once renewable energy resources matured and problems related to intermittency and reliability had been addressed.[31] Finally, as environmental groups' efforts to prevent the coal rush began to pay off, and as the Obama Administration enacted new environmental regulations that made it more difficult for new and existing coal-fired power plants to operate, natural gas became the go-to alternative. Indeed, one organisation labelled natural gas as a "coal killer," arguing that cheap natural gas prices made coal plant closures feasible.[32]

While it is difficult to quantify the impact that the 'natural gas bridge' imagery had on the natural gas boom, it does appear that this positive image at least accelerated it. For decades, Americans had been conditioned to believe that they could have affordable energy or clean energy, but not both. Natural gas offered the best of both worlds, and, in response, many electric utilities began to invest heavily in new natural gas plants or to negotiate contracts for natural gas-based power. As a result, the percentage of natural gas-based electricity rose to unprecedented levels. While natural gas had historically

26 Clayton (2004).
27 Walsh (2012).
28 U.S. Energy Information Administration (2014).
29 Brown et al. (2009); Trembath et al. (2013).
30 Trembath et al. (2013:28–32).
31 Wright (2012).
32 Trembath et al. (2013).

provided no more than 20% of US power, this share shot up to more than 30% in 2012.[33] Yet, as the following section describes, this impressive growth engendered a growing backlash against unconventional gas production.

3 The Natural Gas Bust?

The backlash against natural gas development emerged from a few quarters. At the outset, scientists and some environmental organisations began to question the environmental benefits of natural gas. Over time, studies began to link natural gas to a number of environmental problems, and the image of natural gas began to degrade. The tarnished environmental image of natural gas may actually not be the industry's largest concern, however. Rather, a handful of studies have called into question the economics of the natural gas industry and whether natural gas would remain a low-cost fuel. Most critically, the studies have suggested that natural gas production rates from fracked wells may not produce sufficient gas to pay off the high capital costs of unconventional gas production. Other recent studies also project that available gas reserves are actually much smaller than most forecasters believe. If so, it would appear that the natural gas boom may instead be an unsustainable bubble that could soon burst.

This section will explore the key developments in the backlash against hydraulic fracturing and increased reliance on natural gas in the energy sector. Section 3.1 explores the environmental backlash and the resulting efforts by governments to address environmental concerns. Section 3.2 then examines the economic challenges to the natural industry.

3.1 The Environmental Backlash

The environmental backlash against hydraulic fracturing has intensified substantially since Congress exempted unconventional gas production from many federal environmental laws. The initial backlash against hydraulic fracturing focused on concerns regarding the potential for hydraulic fracturing practices to contaminate underground drinking water. Then, studies began to indicate that the life cycle emissions from natural gas production, transportation, and combustion might actually exceed life cycle emissions from coal. Further studies linked natural gas production to groundwater contamination, surface water contamination, increased localised air pollution, degradation of habitat for imperilled species, and earthquakes.[34] In response to these concerns, the natural gas industry typically rejected any arguments about the potential environmental harms associated with hydraulic fracturing. This resistance did not quell debate, however, and the natural gas industry then formed a partnership with certain national environmental groups to develop 'best practices' for hydraulic fracturing.[35] Though the industry continued to resist environmental regulation, this

33 U.S. Energy Information Administration (2013).

34 Wines (2015).

35 Center for Sustainable Shale Development, Strategic Partners, https://www.sustainableshale.org/strategic-partners/, last accessed 15 January 2015.

approach eventually seemed to backfire. By early 2015, New York State had enacted a ban against hydraulic fracturing,[36] and several local communities had imposed their own moratoria.[37] Although a few of these bans have been upheld and a few have been invalidated, most court challenges were pending at the date of this article's publication. Furthermore, the Obama Administration announced in January 2015 that it planned to enact federal rules to regulate methane emissions from natural gas production, causing concern within the natural gas industry.[38] Thus, by early 2015, the natural gas industry found itself in a decidedly uncertain position as more communities prepared to ban hydraulic fracturing and environmental concerns about hydraulic fracturing intensified.

3.1.1 Groundwater Contamination

In 2010, a documentary film, *Gasland*, stirred widespread national concerns about the potential for hydraulic fracturing to cause contamination of drinking water and other groundwater supplies.[39] The film famously showed homeowners setting their tap water on fire and suggested that the fracking process caused drinking water to become flammable.[40] Although the natural gas industry and some regulatory agencies contested the accuracy of many of the claims made in *Gasland*,[41] concerns about groundwater contamination persisted. Indeed, concerns about the effects of hydraulic fracturing on groundwater pre-dated the release of *Gasland*,[42] and they have only intensified since then. Some of concerns about underground water contamination are well founded. For example, in California, a state agency authorised direct disposal of contaminated fracking wastewater into freshwater aquifers that the state believed were too deep to use for irrigation.[43] Scientists have also documented that hydraulic fracturing has caused contamination of underground drinking water sources through surface spills, faulty well construction, and leaking cement casings.[44] In contrast, studies released in

2014 concluded that chemicals injected deep underground during the fracking process could not migrate upwards to drinking water sources.[45] Thus, while science confirmed that hydraulic fracturing has caused some instances of groundwater contamination, the contamination appears to result from poor operations and design, rather than

36 Kaplan (2014).

37 Polley (2013:267).

38 Davenport (2015).

39 *Gasland* (New Video Group 2010), available at http:// www.gaslandthemovie.com/, last accessed 1 February 2015.

40 (ibid.).

41 Fershee (2014: 822–823).

42 See Wiseman (2009:122).

43 Lustgarten (2014); see also infra notes 61–63 and accompanying text (discussing how drought in California led farmers to use water from these contaminated aquifers).

44 U.S. Environmental Protection Agency (2015).

45 Darrah et al. (2014); Craig (2014).

uncontrollable migration of pollutants.[46] This would suggest that better practices could eliminate much of this pollution.[47]

3.1.2 Greenhouse Gas Emissions

Best practices could reduce greenhouse gas emissions associated with unconventional gas production, but this would in all likelihood not end the escalating debate about the role of natural gas as a bridge toward climate-friendly renewables. In part, this is because scientists, environmentalists, the natural gas industry and policy makers dispute the degree to which natural gas production contributes to climate change.[48] Even if these parties were to reach agreement about the science, they are not likely to reach agreement about the role natural gas should play in mitigating climate change.

The scientific debate about the life cycle emissions of unconventional natural gas production began in 2011, when scientists began to estimate how leaking methane – a greenhouse gas that is 25 to 34 times as potent as carbon dioxide – from natural gas production could offset the reductions in greenhouse gas emissions that result from burning natural gas instead of coal.[49] One influential study by a climate scientist at the National Center for Atmospheric Research concluded that leakage rates would have to stay below 2% for natural gas to be more climate-friendly than coal.[50] Then, in 2012, a pair of studies concluded that the life cycle emissions of greenhouse gases from natural gas are likely to exceed those of coal, owing to methane leakage.[51] These studies sparked an ongoing debate among scientists regarding how much methane actually leaks from gas operations, the proper numbers to use when comparing methane to carbon dioxide, and a number of other fundamental issues regarding the calculation of life cycle emissions.[52]

While the scientific debates remain unresolved, that has not prevented environmental groups, the natural gas industry, and policy makers from joining the fray. A fundamental point of contention is whether natural gas can and should really serve as a bridge at all. As noted above, advocates of the bridge metaphor argue that natural gas offers an affordable, reliable, and climate-friendly transitional fuel from coal to renewables. However, environmental organisations, renewable energy advocates, and some scientists have begun to challenge this contention, on three primary grounds. First, they argue that the affordability of natural gas has actually undermined support and funding for renewable power development.[53] Second, they dispute that investments in natural

46 Jackson et al. (2014:354) who notes that a survey of groundwater contamination incidents suggests “that most incidents originate from the surface, including faulty wells, wastewater disposal, and spills and leaks from surface operations”.

47 (ibid.).

48 See Parenteau & Barnes (2013).

49 See Wigley (2011); Fulton et al. (2011).

50 Wigley (2011:607).

51 Howarth et al. (2012); see also Romm (2012).

52 Parenteau & Barnes (2013:334–338).

53 See Arnsdorf (2014); Jacoby et al. (2012); Wald (2014).

gas will somehow lead to increased investments in renewable power.[54] Finally, and perhaps most fundamentally, any investments in new fossil fuel resources and power plants could undermine efforts to address climate change. With a number of studies now arguing that humanity must leave most known fossil fuel resources untouched to prevent catastrophic climate change,[55] opponents of the bridge metaphor argue that any reliance on new natural gas resources is unwise.

The debate regarding the climate benefits of natural gas has thus intensified in a very short time, and this has certainly tarnished the image of natural gas as a golden fuel in the eyes of many. It remains to be seen whether forthcoming environmental regulations designed to limit methane leaks – and thus reduce the life cycle emissions of natural gas – will help to restore the status of natural gas, or whether the urgency of climate change will prompt many more environmental groups and policy makers to eschew the fuel in favour of renewables. However, even if the industry can quell concerns about climate change, it may not be enough to remediate the declining image of natural gas, as the following section explains.

3.1.3 Other Environmental and Public Health Impacts

A number of other environmental and public health concerns have emerged as unconventional natural gas production has boomed. Although these have generally gained less attention than concerns about groundwater contamination, they may present even greater environmental and public health risks. This section will highlight a few of the key concerns that have arisen.

The consumptive use of water in fracking operations is a major concern that has intensified in states with water shortages and protracted droughts.[56] Average water use per well varies in different regions of the country, but, on average, fracking operations require five to six million gallons of water for the drilling and fracking process.[57] This water use, moreover, is almost completely consumptive; the majority of water used to frack wells remains underground, and the water that returns as flowback is usually too polluted to re-use or treat.[58] While some places in the United States have ample water supplies and thus may not find water consumption a limiting factor, many unconventional gas production sites occur in water-stressed locations.[59] This dynamic creates intense competition for water resources and often pits the natural gas industry against farmers, ranchers, and municipalities.[60] Water stresses have also exposed the natural gas industry

54 Arnsdorf (2014).

55 See McCabe & Elkins (2015); Leaton (2011).

56 Freyman (2014).

57 (ibid.:15); see also Tomain (2013:1209), who states that the average well requires three to five million gallons of water.

58 Powers (2011:920), who states that nine to 35% of the water returns to the surface; Hammer & VanBriesen (2012:11); Freyman (2014:39–42).

59 Freyman (2014:49–75).

60 (ibid.).

to increased scrutiny that may constrain its ability to continue operating. In California, for example, a long-running drought forced farmers to begin tapping deep freshwater aquifers into which a state agency had authorised fracking wastewater disposal.[61] In response to the public outcry, state officials directed oil and gas companies immediately to suspend their disposal operations, effectively halting oil and gas extraction in the area.[62] This incident, moreover, only intensified local government and voters' efforts to ban hydraulic fracturing in order to protect diminished water supplies.[63] With water stress likely to persist in many places in the United States, water supplies could be a limiting factor for the natural gas industry in the future.

Air pollution caused by natural gas production has also become an increasing concern in many areas, but the regulatory response has lagged. Monitors have detected elevated levels of carcinogenic, hazardous air pollutants near production wells.[64] Ground-level ozone, or smog, levels have also increased near drilling locations.[65] In response to some of these concerns, the EPA attempted to apply existing Clean Air Act regulations to natural gas production activities, but was rebuffed, twice, in the courts.[66] This does not mean, however, that the natural gas industry is in the clear, as the EPA can promulgate new rules that apply specifically to some emissions of pollutants from hydraulic fracturing production. Whether it will do so remains to be seen.

Another emerging concern related to unconventional gas extraction is increased seismicity. Scientists have linked fracking operations with increasing numbers of earthquakes in Oklahoma and Ohio; and other areas not known for seismic activity have experienced unprecedented numbers of earthquakes. To date, no regulatory response has emerged to address the seismic activity, but advocates of fracking bans have begun to point to the earthquakes as another reason to prohibit hydraulic fracturing processes in their communities.[67]

Community disruption is another major concern related to unconventional gas extraction.[68] The hydraulic fracturing process is an equipment-intensive activity, particularly during its early stages. To bring equipment, water, chemicals and workers to fracking sites, the industry often deploys a fleet of large trucks – often moving on newly constructed roads – into areas that have not previously been industrialised.[69] Moreover, natural gas companies must also often build gathering lines to collect natural gas and

61 Lustgarten (2014:44).
62 (ibid.).
63 Onishi (2014).
64 Biello (2010).
65 Nelson (2011); Argetsinger (2011:336).
66 *Summit Petroleum Corp. v EPA*, 690 F.3d 733 (6th Cir. 2012); *National Environmental Development Association's Clean Air Project v EPA*, No. 13-1035 (D.C. Cir. May 30, 2014).
67 Onishi (2014).
68 Tomain (2013).
69 (ibid.).

deliver it to existing pipelines.[70] These activities cause noise pollution, light pollution, stormwater pollution, increased traffic, and a host of other impacts that communities sometimes come to regret.[71] As with earthquakes, the typical response to these concerns has been local bans, because regulatory efforts are often non-existent or fall short of community demands.

Finally, concerns have emerged regarding the impacts that hydraulic fracturing may have on imperilled species, particularly as a result of destruction and fragmentation of habitat by construction, as well as disturbances to sensitive species by sounds, the presence of humans in previously unused areas, and other consequences of production activities.[72] Many gas reserves lie beneath the habitat of several species protected under the Endangered Species Act, a notoriously strenuous statute that could make natural gas production much more expensive, if not prohibit it.[73] Although Congress sought to insulate the natural gas industry from the reach of the Endangered Species Act in as far as it applies to sage grouse species,[74] the Endangered Species Act, which also lists other species for protection, could nonetheless impede natural gas development.[75]

Collectively, the environmental and public health impacts of unconventional gas production using fracking processes have garnered increased attention since the natural gas boom began. The regulatory response to these concerns has only begun to catch up, and only in a handful of arenas. Frustrated by the slow pace and inadequacy of regulations, many communities – and a couple of states – have imposed moratoria and bans on hydraulic fracturing. The natural gas industry has, predictably, fought back against these bans, and litigation regarding fracking is likely to increase moving forward. These dynamics will only increase the economic uncertainty that may be plaguing the industry as a whole, as the next section explores.

3.2 The Economic Reality?

The economics of unconventional gas production have faced increased scrutiny, calling into question the role that natural gas will play in the US energy system moving forward. For years, conventional wisdom held that the technological innovations in fracking and horizontal drilling would enable the United States to have as much as one hundred years of an affordable natural gas supply.[76] More recent studies that have looked at the economics of unconventional gas production have raised significant doubts about whether natural gas will remain cheap over the long or even near term. Several factors contribute to these economic reservations.

70 (ibid.).
71 (ibid.).
72 See Robbins (2013:1154–1160).
73 (ibid.:at 1154–1166).
74 Valentine (2014).
75 Robbins (2013:1160–1166).
76 See, e.g., Potential Gas Committee (2012).

First, high initial costs may not be recovered quickly enough (if at all) owing to uncertain production rates. Unconventional gas production is a capital-intensive, expensive process.[77] Many players in the US gas industry, moreover, are small, independent operators who depend upon quick revenues from productive wells to finance their operations.[78] However, production rates vary from well to well and gas formation to gas formation.[79] Production rates at unconventional gas wells also tend to fall off substantially and relatively quickly after the initial flow, but then remain productive at low but stable levels for a period of years.[80] For a cash-dependent, capital-intensive industry, high initial flow rates may be critical for economic survival.[81] Yet, these initial production rates are highly variable. In some places, fracked wells have produced abundant initial flow rates and remained productive at lower levels for a number of years.[82] In other places, however, fracked wells have produced little gas initially and, while they may produce small amounts of gas over time, the long-term returns may never make up the initial capital costs invested in the well.[83]

The precipitous decline in initial flow rates, even from highly productive wells, raises a second economic concern that analysts refer to as the unconventional gas "treadmill."[84] Specifically, to maintain existing production levels, natural gas companies must continually drill new wells and incur the significant upfront costs associated with drilling.[85] According to one analyst, the industry would need to drill 130 000 new wells, at a cost of $910 billion, to produce 14,8 billion cubic feet per day by 2040.[86]

In comparison, existing production rates are estimated to be approximately 37 billion cubic feet per day.[87] If these projections are correct – but it is important to note they are disputed – the natural gas industry could find itself in an endless cycle in which it must drill more and more new wells simply to lose ground at a slower rate.

Third, projections about the overall health of the industry may be relying on overestimates of the total recoverable gas supply and unrepresentative high production levels from a handful of natural gas wells. In 2014, scientists at the University of Texas released a study suggesting that US natural gas production would peak in 2020 and then begin to decline.[88] A report released by the Post Carbon Institute in 2014 concluded

77 Fitzgerald (2013:1342–1343).
78 (ibid.:1343).
79 (ibid.).
80 (ibid.:1344); Hughes (2014:11), who notes that production levels decline by 74 to 88% over a three-year period, depending upon the shale formation at issue.
81 Fitzgerald (2013:1343).
82 (ibid.).
83 (ibid.); Hughes (2014:12).
84 Ernst & Young (2014); Hughes (2014:11).
85 Hughes (2014:11).
86 (ibid.:16).
87 (ibid.:170).
88 Inman (2014:29).

that production could peak in 2016.[89] These estimates contradict official predictions of the U.S. Energy Information Administration (EIA), which project continued growth in natural gas production until 2040.[90] Although these conflicting projections may simply indicate legitimate scientific disputes, analysts within the EIA have themselves suggested that the Texan scientists' methodology is likely to be superior and produces more accurate results.[91] If that is true, then the long-term viability of the natural gas industry is questionable.[92] Indeed, questions about the industry's viability emerged years ago, when the *New York Times* reported that internal EIA documents showed that many agency analysts believed that much of the hype regarding the natural gas boom was based on irrational exuberance.[93] Specifically, one EIA document suggested that "companies have exaggerated 'the appearance of shale gas well profitability,' are highlighting the performance of only their best wells and may be using overly optimistic models for projecting the wells' productivity over the next several decades".[94] If these internal doubts are realised, then it is possible that the natural gas boom may indeed prove to be an unsustainable bubble.

It is possible that some of the economic dynamics discussed above – namely the initial production rates of fracked wells – may only eliminate smaller producers from the industry and allow larger, better capitalised companies to gain a greater share in the industry. Indeed, the natural gas industry experienced a number of mergers from 2009 to 2011, which may add stability to the industry. On the other hand, some analysts believe that these mergers may actually allow (and have allowed) any natural gas bubble to grow.[95] In any event, if the scientists at the University of Texas are correct and the natural gas reserves are much smaller than agency analysts say, the natural gas sector as a whole – and potentially the US economy – is potentially in line for a rude awakening.[96]

3.3 The Potential Consequences of a Natural Gas Bust

While this article will not explore in depth the consequences of a natural gas bust, a few potential consequences deserve mention. First, a natural gas bust could expose electricity consumers to escalating prices. The boom in natural gas production has spurred construction of many new natural gas power plants and has potentially exposed power consumers to escalating electricity prices if natural gas becomes more difficult to extract or if producers cannot recover upfront capital expenses through initial flows. While higher prices could then provide natural gas companies with the revenues they need to

89 Hughes (2014:11).
90 Inman (2014:29).
91 (ibid.:30).
92 (ibid.).
93 Urbina (2011).
94 (ibid.).
95 Rogers (2013:1, 2).
96 (ibid.:20–21).

expand production to maintain fuel supplies, this would effectively commit electricity consumers to perennially high power prices to support increasingly expensive natural gas production. Alternatively, higher prices could result in the premature closure of natural gas plants and stranded costs for utilities, their shareholders, or their ratepayers. While this could ultimately promote more renewable energy use in the power sector, it will also essentially require stakeholders to pay twice for their power – once for the failed natural gas plants and once for the new renewable plants. Beyond the power sector, a natural gas bust raises a host of other questions regarding closure of wells, remediation of production sites, maintenance of pipelines, and other activities to safely manage the existing natural gas infrastructure.

Admittedly, discussions of a natural gas bust are quite speculative. However, as the next section indicates, other countries would be wise to consider that possibility as they consider embarking on their own efforts to pursue unconventional natural gas production.

4 Conclusion: Lessons from the United States

For countries that are considering whether to commence with their own unconventional natural gas operations, the US experience so far should serve as a cautionary tale about the potential environmental and economic risks. While it is true that the natural gas industry has had an important impact on the US economy, it is unclear whether these short-term economic gains will benefit the country over the long-term. Indeed, concerns about a natural gas bubble raise troubling questions about how the US electricity sector and economy will respond if a bubble actually bursts. Moreover, as concerns about the environmental impacts of hydraulic fracturing increase, regulators and political leaders have struggled to address proven and suspected consequences of fracking. In many US jurisdictions, the only viable response has been to ban hydraulic fracturing entirely. And while this response may make sense, it will undoubtedly spur litigation and further increase the costs associated with unconventional gas production. At the very least, countries seeking to learn from the United State should engage in a much more critical, precautionary approach before they decide to allow hydraulic fracturing to proceed within their own borders.

In pursuing this precautionary approach, other countries should also consider the limited understanding that the United States still has about its own natural gas reserves and the economic viability of the gas industry, despite the existence of tens of thousands of wells and ongoing production. In other countries with far fewer wells, projections about natural gas resources are probably far less accurate.[97] Rather than gamble with the uncertainty inherent in unconventional natural gas production, countries would be far wiser to invest in resources they can see, quantify, and readily exploit. Just as

97 Inman (2014:30) "If forecasting is difficult for the United States, which can draw on data for tens of thousands of shale-gas wells, the uncertainty is much larger in countries with fewer wells."

some utilities in the United States have turned their focus to renewable resources, other countries should do the same.

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18.
REGIONAL ENERGY: INTEGRATING ENERGY FLOWS WITH GOVERNANCE

Manisha Gulati, Louise Scholtz & Firoz Khan

1 Introduction

Africa faces an enormous challenge in the energy sector in the form of insufficient electricity generation capacity, inadequate transmission and distribution infrastructure, poor quality of power supply and heavy reliance on biomass based cooking fuels such wood, charcoal, dung and agricultural residues. Of even greater concern is the bleak prospect of providing universal energy access to the growing population in the coming decades. This in spite of existing polices and plans aimed at expanding electricity access. Southern Africa[1], led by South Africa, Mozambique and Tanzania, has the second-largest energy demand growth of any sub-region (after West Africa), with particularly strong demand growth in Mozambique and Tanzania, increasing on average by 3,7% annually.[2]

Given the abundant energy resources, both renewable energy (RE) (solar, wind, geothermal and hydro energy) and fossil fuels (oil, gas and coal), Southern Africa should have abundant electricity. However this is not the case. The Southern African region is faced with a severe energy crisis. Less than half of the region's population has access to electricity.[3] The situation is worse in a rural–urban comparison as only 31% of rural areas in the region have access to electricity. Electricity access rates vary widely among countries in the region (see Figure 1). The lack of access to modern energy sources means that biomass remains the major source of energy in most countries in the region. Biomass such as such wood, charcoal, dung and agricultural residues accounts for more than 45% of final energy consumption in the region, and its use exceeds 60% of final energy consumption in countries such as Mozambique, Tanzania and Zambia.

1 South Africa, Angola, Botswana, Lesotho, Malawi, Mozambique, Namibia, Swaziland, Tanzania, Zambia and Zimbabwe.

2 IEA (2015).

3 REN21 (2015).

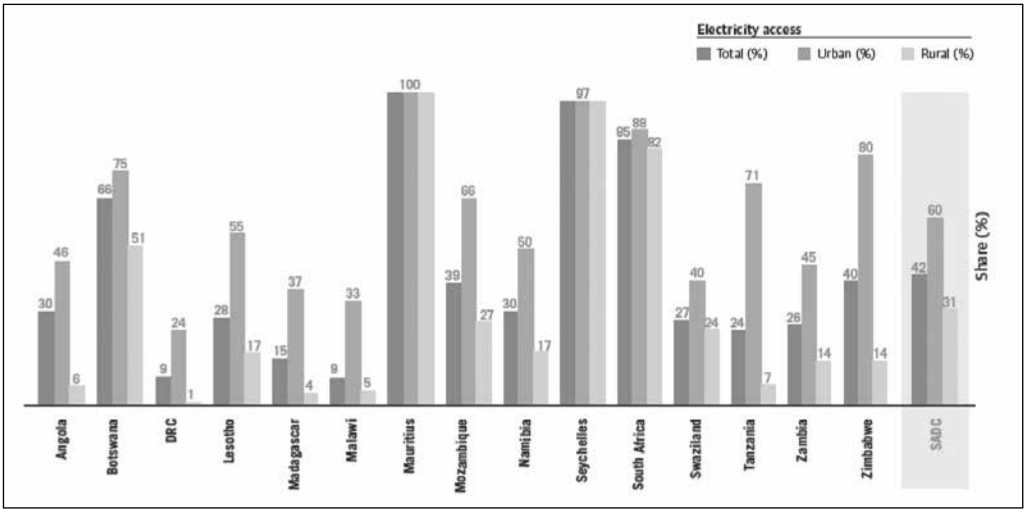

Figure 1: Electricity access in Southern African countries in 2012
Source: REN21 (2015).

In theory, this situation can improve rapidly and dramatically on the back of the recent energy discoveries in the region that can support transformative investments in energy infrastructure.[4] In terms of oil and gas deposits, it is estimated that there are 100 trillion cubic feet (tcf) of natural gas in Mozambique,[5] 11 billion barrels of oil off the coast of Namibia[6] and 1,3 tcf of good quality dry gas in the Kudu gas field of Namibia,[7] 35 billion cubic feet (bcf) of natural gas in Tanzania, potential reserves of at least 400 tcf of shale gas in South Africa in the Karoo region, and the possibility of more oil and gas along the west coast of South Africa in the Orange River basin, an extension of the Namibian fields. Although South Africa has the largest (over 90%) proven reserves on the African front,[8] enormous reserves of coal have been located in Mozambique in Moatize, Changara and Cahora-Bassa, and there are potential coal fields in Cabo-Delgado, Niassa and Manica.[9] Zimbabwe, Botswana, Tanzania, Zambia, Swaziland and Malawi also have significant coal reserves.[10] Clearly, the region is flush with energy reserves that could provide the needed resources to address the energy crisis that has come to define the region.

Underpinning the underexploitation of energy sources is the inability to access funding for investment in infrastructure, particularly from the private sector, owing to poor creditworthiness of countries and utilities. This is exacerbated by high political risk

4 Besada et al. (2015).
5 CIP & AWEPA (2013).
6 Kearney (2013).
7 PwC (2013).
8 EIA (2015c).
9 CIP & AWEPA (2013).
10 IEA (2015).

and lack of capacity to develop projects.[11] In addition, energy resources are not evenly distributed across the region, resulting in underexploitation in certain areas and scarcity and high costs in others. Underexploited energy resources also result in unmet demands, which impede growth and development.[12]

Seizing the energy exploitation opportunities to ensure energy security would necessitate that countries in the Southern African region install plans to utilise either these reserves or the revenues accruing from the exploitation of these reserves, thereby providing universal access to energy and meeting industrial sector needs. The options are many, and could include countries working together in the early phases of exploration to identify regional opportunities for developing new large-scale generation and transmission infrastructure, in particular the missing links in the Southern African Power Pool (SAPP) interconnections (Angola, Malawi and Tanzania);[13] cross-border trade of energy; exploring options for gas-based electricity generation around the SAPP; adding to the existing gas-to-liquids (GTL) refining capacity in South Africa to supply to the region; building joint refining capacity for the region; and exploring joint options for investing to realise them. In any case, South Africa has seen increasing shortages of oil and stranded refining capacity.

Such an approach would also enable converting the available energy resources into low-cost energy and feedstock sources – going beyond alleviating regional energy shortages – to providing cost advantages for developing and maintaining a manufacturing base. However, this would require improved management of revenue and resources, as well as transparent processes that will result in more effective use of coal, oil and gas revenues.[14]

It is therefore understandable that many argue that future energy security in Southern Africa will be dependent on regional solutions, particularly if the objective is universal access to clean, modern, and efficient sources of energy. Intra- and interregional trade that could support the export of relatively low-cost energy to energy-poor areas will also lead to overall lower costs and improved reliability that are necessary for building industries, information and communications technology development, effective irrigation, and attempts to expand access to electricity.[15]

Although various regional power pools have been established to address issues of efficiency through cooperative planning and improved transmission, trade in electricity is relatively limited. Over and above the reasons already highlighted above, this article argues that the major stumbling block to an integrated energy future that can both unlock energy for the region, as well as support growth, new industries and development relates to issues of governance, and more particularly to a lack of

11 IEA (2015); SADC (2012a).

12 IEA (2015).

13 AfDB (2011).

14 IEA (2015).

15 (ibid.).

political will,[16] that manifests itself either through rentier[17] behaviour or the running of a rentier state. This rentier behaviour that prevails in many Southern African countries and the resulting patterns and culture of accumulation that it supports means that energy reserves are exploited in a manner that allows for maximisation of rents derived for the elite. Further, mismanagement of resources and corruption that has come to define rentier behaviour also means that the state is more concerned with the political distribution of these rents than with reinvesting them to promote investment[18] in, say, infrastructure, which could ensure universal access to energy and energy security.

This article is structured as follows: The next section discusses the SAPP and highlights some of the reasons why it fails to fulfil its potential. In the third section, the rentier argument is illustrated by a series of vignettes focusing on South Africa, Angola, Nigeria and Tanzania, which supports the author's hypothesis and the implications this holds for universal energy access. The penultimate section sets out the implications for energy security in Southern Africa. The chapter concludes by suggesting that true regional energy integration and energy security is unlikely unless rentier politics is dismantled. This is likely to be easier said than done, since the power of change lies with the rentiers themselves. Arguably only an energy crisis can redirect the existing model that promotes and rewards naked self-interest to a developmental one. However, such a discussion falls beyond the scope of this article.

2 The Rentier Behaviour Experience with Energy Resources

As already demonstrated, there are compelling reasons for energy integration on a Southern African scale. The region is far from traditional markets such as Europe and it is in the region's interest to pursue high rates of economic growth. Electricity supply constraints, manifested as rolling blackouts,[19] are a significant obstacle to future growth. Thus, a regional approach using market mechanisms will go a long way to addressing present electricity challenges in the region.[20]

To date, the most electricity by far is traded by the Southern Africa Power Pool (SAPP), i.e. over 5,3 TWh of electricity was traded in 2012–2013.[21] Most of this was supplied by South Africa to Botswana (meeting almost all of Botswana's demand) and Namibia (nearly half of its demand). At the same time, South Africa also imported around 10 TWh of electricity in 2012 from Mozambique's Cahora Bassa project, but then exported the bulk of it back to Mozambique to supply Maputo (more specifically, the Mozal smelter).

16 Maupin (2013).

17 A rentier state is a state which derives all or a substantial portion of its national revenues *from the rent of indigenous resources to external clients*. See https://en.wikipedia.org/wiki/Rentier_state, last accessed 16 February 2015.

18 Le Pere (2013).

19 Miketa & Merven (2013).

20 Fakir et al. (2014).

21 Sofreco (2011).

However, and in spite of being the most developed power pool, electricity trade in Southern Africa is negatively impacted by the limitations of the transmission network;[22] the lack of commitment on the part of member states to the implementation of regional priority projects; difficulties in realising cross-border projects; lack of capacity to develop projects at Southern African Development Community (SADC), member state and utility level; uncertain energy demand which makes forward planning difficult; difficulty in accessing finance; and the weak strength of SADC institutions.[23] These reasons deserve deeper interrogation – particularly South Africa's approach to maximising the potential benefits that the SAPP presents – but are beyond the immediate scope of this article.

The bigger challenge to regional energy integration remains rentier politics and the accompanying lack of transparency and executive discretion in revenue allocation. In the context of energy, the rentier state model and rentier politics emerge from the fact that rent derived from the exploitation and sale of energy resources, such as coal, oil and gas, becomes the source of wealth around which both the economic model and governance are organised.

The experience of South Africa, which has a long history with coal given that it has historically had some of the largest coal reserves in the world and has been among the largest coal producing countries,[24] illustrates this point. In other countries in the region, the rentier model is even more explicit than in South Africa, although difficult to demonstrate as many of the energy reserves are relatively newly discovered and not much time has elapsed between the discovery and exploration of these reserves. However, the experiences of Angola further validate the rentier hypothesis. The experience in Nigeria (although not situated in Southern Africa), which has had a much longer history with the management of energy resources than Angola, further strengthens the argument and demonstrates that the rents from energy extraction and utilisation will do little to address the energy challenges of the region.

2.1 Experiences from South Africa

South Africa faces multiple energy challenges. It currently faces severe shortages of adequate electricity generation capacity. At the same time, it is under increasing pressure to find alternatives to its carbon-intensive coal-fired power stations[25] which provide 90% of its electricity. A viable option for South Africa to reduce its dependency on coal could be to switch to a larger percentage of gas in its energy mix. As already mentioned, both Mozambique and Namibia have offshore gas fields which South Africa can exploit. To date PetroSA has already entered into an agreement with Mozambique's state run Petromac. Linked to this, the South African Shanduka Group will develop a 117 MW gas-fired power station near Maputo. Most of the output from this station, namely 85%,

22 IEA (2015).
23 Sofreco (2011).
24 World Coal Institute (2005).
25 Scholvin (2014).

will be sold to Eskom, the vertically integrated and monopolistic electricity utility in South Africa, and the remainder will be taken up by Electricidade de Mozambique. Another example is the Pande Gas Pipeline that links Mozambique's onshore gas fields with Johannesburg.[26] However, this pipeline finds its genesis in SASOL – an integrated energy and chemical company based in South Africa – being an operator in the Pande gas fields rather than a planned strategy of regional energy trade and regional energy security. South Africa has, however, not been as successful in ensuring cross-border cooperation with respect to oil.[27]

Similarly, hydropower offers much potential within the SAPP, providing opportunities, albeit with some challenges, for not only South Africa but also the region. Scholvin[28] highlights the 'odd complementarity of varying natural conditions and different stages of economic development' in Southern Africa that builds a sensible case for cooperation across borders. South Africa has a high demand for electricity, but with low hydropower potential. By contrast, in the neighbouring states – Angola, Mozambique, Zambia – and, further afield, in the Democratic Republic of the Congo, there is potential for hydropower coupled with low electricity demand. Information provided by Eskom reveals that Mozambique and Zambia could transmit another 5 000 and 1 000 MW, respectively, to South Africa. It is expected that Angola and the Democratic Republic of the Congo will be able to supply 20 000 MW to the region after 2025, which would make a substantial contribution to satisfying regional demand. However, realising projects that entail cross-border transport is difficult, and existing projects such as Cahora Bassa on the Zambezi River are the result of long-term bilateral agreements rather than the product of an integrated energy market.[29]

South Africa as the dominant economy and energy generator has a key role to drive energy integration and security. Scholvin[30] argues that coal lies at the heart of South Africa's reluctance to fully realise the potential of hydropower in the region. Historically, South Africa's industrial policy has evolved around cheap energy based on abundant coal supplies and capital-intensive mining and minerals extraction, which have subsequently developed links into downstream industries creating what is called a mineral energy complex (MEC).[31] Although, in direct GDP terms, the MEC accounts for around 5–6%,[32] it continues to be at the heart of the South African economy with its interlinkages in finance, manufacturing, service industries and other sectors. The interlinkages collectively account for close to 20% of South Africa's GDP.[33] The wider linkages that flow from the dominant role of the MEC as a key driver of industrial and macroeconomic policy, economic structure, corporate activity and investments

26 *Pipeline & Gas Journal* (2015).
27 Scholvin (2014).
28 (ibid.:9).
29 Scholvin (2014).
30 (ibid.).
31 See Fine & Rustomjee (1996).
32 Republic of South Africa (2012).
33 (ibid.); Fine & Rustomjee (1996).

have led to the creation of a whole system of high level resource and monopoly rents extraction from the MEC sectors over the last 100 years or so. This system has been largely entrenched.[34] Arguably, only an energy crisis would force South African business and government to pursue the benefits offered by the region in respect of oil, gas and hydropower[35] – and in so doing deepen regional energy integration.

This question becomes even more pertinent when one unpacks South Africa's energy strategy. It has initiated an ambitious RE plan under the Renewable Energy Independent Power Producers Programme, which is widely seen as the most successful roll out of RE in the world. However, the simultaneous development of Kusile and Medupi, the third and fourth largest coal-fired power plants in the world, respectively, raises questions about South Africa's commitment to RE.[36]

Some argue that this seeming dichotomy – the simultaneous pursuit of coal and RE – is a clear example of South Africa pursuing narrow political concerns anchored in the workings and trappings of the extractive economic and political regimes. In other words, South Africa has managed the trade-off between coal-fired and RE-based electricity by allowing the growth in coal exploitation to continue in tandem, with the country's entry into renewables. This has created the space for vested minerals-energy-finance complex interests to enter the nascent renewables sector.[37] This sets the scene for a continuation of this system of accumulation rather than its reconfiguration or discontinuity as it then uses its political agency through already established policy networks to influence praxis in a manner that protects its interests in core sectors.[38]

For instance, one of the major players in this space is the largest Johannesburg Stock Exchange-listed Black Economic Empowerment firm – and the country's second largest coal producer – Exxarro. This company is part of the family of the conglomerate structure of ownership that has wider and entrenched interests within the MEC and abroad.[39] Baker[40] argues that Exxarro is central to Eskom's development plans: it is the sole supplier to Eskom's Medupi power station.[41] Exxarro has also entered into a 50:50 joint venture with a Tata Power Company subsidiary – Khopoli Investment – with which it formed Cennergi, a leading wind energy generator.[42] With coal at the core of Exxarro's business, it wields considerable political influence. It remains to be seen whether its entry into the renewables sector will be utilised as an enabler or disabler of further growth in that sector.[43]

34 Walker (2005).
35 Scholvin (2014).
36 Winkler & Marquard (2009).
37 Baker (2013).
38 See for example Baker (2013).
39 (ibid.:12).
40 Baker (2013).
41 (ibid.:14).
42 (ibid.).
43 (ibid.).

Similar thorny dilemmas and questions around rent seeking and elite capture are raised around South Africa pursuing shale gas and particularly nuclear energy. Despite widespread societal concerns and protestations pertaining to the affordability of the nuclear option and the transparency of the process, the government seems intent on procuring 9,6 GW of nuclear power without first doing a cost-benefit analysis. Cabinet approved the deal at its last meeting of 2015. The programme is controversial, as several independent studies have found that the cost of new nuclear energy will be greater than energy produced by other technologies.[44] It then seems odd that instead of looking at options such as gas which is available in abundance in the region, the government is choosing to opt for nuclear energy.

There is also deep suspicion that the procurement will be corrupt, with Russia claiming some time ago that it had already struck a deal with South Africa.[45] Following concerns raised by the head of the South African Treasury relating to the fiscal viability of nuclear plants for South Africa, he was subsequently unceremoniously sacked by Jacob Zuma, the president of South Africa. Compounding the suspicions of rent seeking are reports that Zuma's personal friends, the Gupta family from India, had invested heavily in uranium mining, even before talk of the new nuclear programme had become official.[46]

Arguably, the opportunity to restructure electricity on a regional basis and furnish the necessary resources to provide bankability, which could potentially promote dynamic and developmental trade integration, has fallen prey to the myopic short-term financial vision and greed of the elite. Put differently, rather than assisting and contributing to the vertical deepening of the industrial bases of the Southern African countries (wider than static competitive advantage) – as preceding or running parallel to region-wide horizontal industrial policies – the South African elite seems to choose rentierism and cronyism.

2.2 Experiences from Angola

Angola is one of the biggest producers of oil on the continent, with oil accounting for over 95% of exports and about 75% of fiscal revenue.[47] GDP grew by an annual average of 15% between 2002 and 2008 during the oil production boom, and has since continued to grow at 5–6% after recovery from the global financial crisis and fall in oil prices.[48] What is noteworthy is that 90% of the country's oil is exported to countries outside SADC, within which the Southern African region is situated.

Despite this oil wealth, domestic oil consumption remains low and energy shortages remain high. On the liquid fuels side, the offshore pipelines being built to transfer gas to the liquefied natural gas (LNG) plant in Soyo are geared towards exports. The reason

44 Paton (2015).
45 (ibid.).
46 *The Argus* (2015).
47 IMF (2015).
48 (ibid.).

cited is that exports would help monetise the oil and gas resources in the absence of pressing domestic demand. This when almost 50% of the country's primary energy consumption comprises traditional solid biomass and waste.[49] On the electricity side, only 30% of the country's population had access to electricity in 2012.[50] Electrification in rural areas remains poor at 8%.[51]

Although Angola publishes detailed reports about the earnings from oil, observers have expressed far too many concerns around the data for these to be accepted as reliable or comprehensive.[52] They have pointed out that there are remarkable gaps in the data on oil income tax and production and transaction taxes paid by oil companies.[53] One of the main difficulties in independent verification of data and assessment of the revenues from oil for Sonangol, the state oil company, is that the levels of transparency around oil deals are said to be low on account of confidentiality agreements signed between the state and contractors.

Concerns have been raised that significant amounts of revenue from oil have eluded the country's central bank and disappeared.[54] Sonangol, which is both concession-granter and regulator of the oil industry, has been accused of siphoning part of the oil revenues to the political elite.[55] The International Monetary Fund (IMF) has expressed concern that Sonangol incurs huge off-balance sheet expenditures.[56]

A 2011 IMF report also highlighted that public funds of USD32 billion linked to Sonangol are not accounted for.[57] Although it was later discovered that USD27,2 billion could be traced as unrecorded expenditure by Sonangol on behalf of the Angolan government, the outstanding amount has remained unexplained.[58] What is more disturbing is that the recurrent domestic arrears and the non-reconciliation of the mentioned oil revenues have continued to be raised as public financial management concerns since 2014.[59]

This is not to suggest that no developmental or improved energy outcomes have been seen in Angola. Rents from energy have been invested in other infrastructure and have been used for increased public social spend. However, as has been pointed out, the reinvestment of rents has largely benefitted the elite and has failed to improve the standards of living for the vast majority of the population.[60]

49 (ibid.).
50 EIA (2015b).
51 (ibid.).
52 OSISA-Angola & Global Witness (2011).
53 (ibid.).
54 CNN (2012).
55 (ibid.).
56 (ibid.).
57 Peak Oil (2015).
58 (ibid.).
59 IMF (2014).
60 CNN (2012).

2.3 Experiences from Nigeria

The poor outcome of energy security and widespread energy poverty of Angola resonates with that of Nigeria, which has had a longer history and experience of dealing with energy resource endowments. Nigeria is the largest oil producer on the African continent and is among the world's top five exporters of liquefied natural gas (LNG). Oil and natural gas in Nigeria account for 75% of government revenue and 95% of total export revenue.[61] Between 1970 and 1999, the Nigerian petroleum industry generated about USD231 billion in rents, or USD1900 for every man, woman, and child.[62]

The country's abundant energy resources are in sharp contrast with the prolonged and chronic energy crises that have come to dominate them. As much as 80% of the country's total primary energy consumption in 2012 came from traditional biomass and waste.[63] Although crude oil production has plummeted in recent years, its production has been significant. Yet domestic consumption of oil has been exceptionally low (see Figure 2). Diesel shortages have crippled industrial production that is reliant on diesel-based private electricity supply in the absence of a reliable grid.[64] Interestingly, the main reason for the unreliable and unavailable grid is the shortage of gas for the gas-dominated grid, despite the fact that the country is a leading global gas exporter.[65] The gaps in energy infrastructure also extend to the oil and gas sector. It is well-known that the lack of infrastructure is resulting in un-restrained gas flaring. Although the country has five domestic refineries owned by the government with capacity to process 450 000 barrels of oil per day, the capacity utilisation rate of these refineries remains at a poor 40%. Consequently, imports constitute more than 75% of domestic petroleum product requirements.

61 EIA (2015a).
62 Ross (2003).
63 EIA (2015a).
64 Iwayemi (2008).
65 (ibid.).

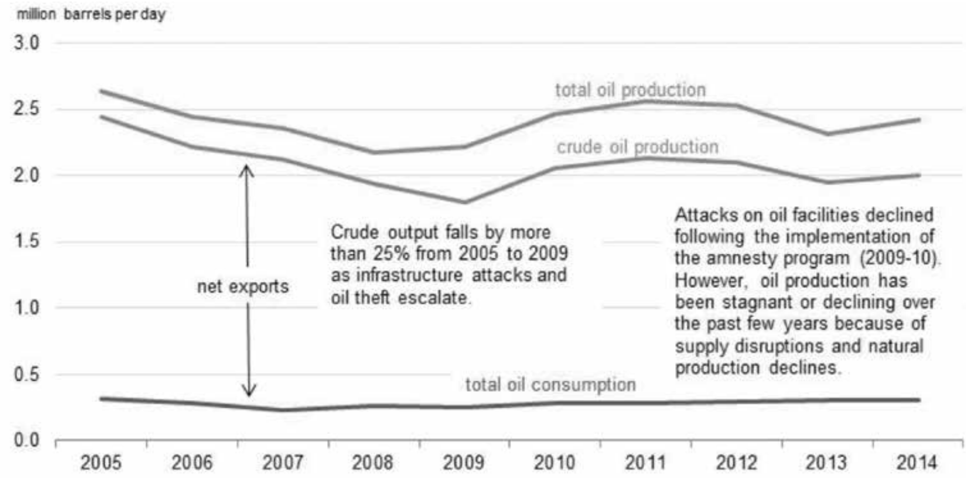

Figure 2: Production and consumption of petroleum and other liquid fuels in Nigeria
Source: US EIA (2015a).

This poor state of affairs regarding the country's energy infrastructure and the widespread energy poverty is striking, given the oil and gas wealth with which the country is endowed, and which have, by all accounts, been sources of windfall gains for the country.[66] There is little indication to suggest that revenues from oil and gas have been adequately invested in energy security through capacity expansion in the energy industry and to bring affordable, reliable, clean and modern energy sources to the people.

This dichotomy has been attributed to the rentier state model and the culture of accumulation spawned by it. Substantial literature exists on how a substantial part of the windfall gains incurred by the country, both during the three oil booms and during the years of the petroleum crisis, was absorbed by the country's elite[67] which dominate all levels of the government. The oil reserves are under state control and are a source of wealth to those who control them and their political allies.[68] Those who have sought to get rich have struggled for a share of these rents, instead of engaging in productive entrepreneurship.[69]

Local content policies for the industry that were intended to develop domestic capacity were used to reward cronies and led to the emergence of domestic companies that were created solely for rent-seeking purposes.[70] Assets such as the Kaduna and Port Harcourt refineries were sold in 2007 to a local consortium headed by Aliko Dangote,

66 See for example Ross (2003); Rosenstein (2005).

67 See for example Coolidge & Rose-Ackerman (1997); Ross (2003); Rosenstein (2005); and Deacon & Rode (2012).

68 Coolidge & Rose-Ackerman (1999).

69 (ibid.).

70 Vines et al. (2009).

the country's wealthiest businessman and an ally of the president.[71] These rent-seeking activities of the elite and the call for expanded access to rents has, in fact, led to conflict that has increasingly become violent in nature over a period of time, insecurity, and theft of oil in the Niger Delta, thereby adding to the worsening energy situation in the country. The related unrest also led to the downfall of several governments, but did not change the regime of corruption and rent seeking.[72] Continued corruption only led to the rents being shared by subsequent governments and their cohorts.[73]

Another noteworthy aspect in both Angola and Nigeria is the flaring of gas. As Angola and Nigeria flared over 200 and 800 billion standard cubic feet of gas, respectively, in 2010, electricity shortages have worsened and even hampered economic growth. If even half of this flared gas could have been converted into electricity, electricity generation would have increased by 350%, in each economy, with the impact on downstream economic activity increasing GDP by 30% in each economy.

3 Implications for Energy Security in Southern Africa

The potential for renewable energy and hydropower, in particular, has already been touched upon above. Similarly, new oil and gas discoveries provide an unprecedented opportunity to meet regional and domestic energy challenges, while boosting economic and social development. On the electricity side, gas is a low-cost, flexible power source and can adequately generate above base load to meet the peak demand. By substituting expensive diesel generation during peak hours, it can reduce the cost of electricity. In South Africa, diesel generation to cater for peak demand is said to cost ZAR5 per kWh.[74] In other parts of Africa, gas can reduce the share of oil-based generation plants in the power mix, in particular generators, and in so doing reduce the average cost of generation. However, this might entail challenging those with vested interests that profit from expensive diesel supply.[75] Gas can also facilitate development of renewable energy sources. On the other hand, the oil discoveries can provide a local, relatively secure additional source of crude oil for the region, which is largely dependent on oil from the Middle East and Angola. Besides substantially improving the security of crude oil supply to refineries in South Africa, regional oil could reduce freight costs and provide more flexibility in scheduling supplies and managing stocks for the different countries in the region.

However, as in Nigeria and Angola, and to a lesser extent in South Africa, these opportunities are not pursued, because of the dominance of a rent-seeking culture and politics. The interest of the dominant rentier elites would lie in realising high rents from the available energy reserves. This is likely to lead to two outcomes.

71 (ibid.).
72 Coolidge & Rose-Ackerman (1999).
73 (ibid.).
74 Silinga & Gauche (2014).
75 IEA (2015).

First, the foreign exchange difficulties of most countries in the region, the poor payment capacity of the domestic market, and the global demand for oil and gas will mean that the highest revenues can be realised from exports. This means that the energy reserves of the region are likely to be exported outside of the region. This is corroborated by the fact that two-thirds of energy investment in Africa since 2000 has gone toward developing and transporting oil and gas for export.

These exports will come on the back of exploration and production contracts awarded to foreign operators, often in partnership with state-owned companies. And this is indeed the case. For example, a review of the main operators of oil and gas contracts and the companies involved in coal production and exploration in Tete province in Mozambique suggests that the contracts have been awarded to foreign companies, with the Mozambican state oil and gas company and domestic companies holding a minority of shares in these contracts.[76]

While the rents from exploration and production contracts would undoubtedly be remarkable, there are low levels of transparency in the awarding of contracts in most countries in the region and limited disclosure of contracts, sometimes even by government. Policies such as those in Mozambique[77] mean that there is no way of knowing the quantum of revenues accruing to states from these reserves. Consequently, there is no accountability for governments in terms of how the rents are being deployed to improve domestic energy infrastructure. Moreover, with revenues coming from relatively few, mostly foreign taxpayers, government accountability on revenue flows becomes limited. Finally, there is a propensity with the culture of rent seeking that large portions of revenues accruing to state-owned companies or to other state agencies are misappropriated by the rentier elite who dominate or have deep connections with the government.

This can be seen in Tanzania. In 2013, senior government officials in Tanzania were accused of fraudulently authorising payments of at least USD122 million from public funds.[78] The funds were said to have come from the joint escrow account of the state power company TANESCO and independent power producer IPTL and were allegedly diverted to IPTL's owner, Pan Africa Power.[79] This was later verified by the country's public accounts committee (PAC) which confirmed that senior officials authorised fraudulent payments to offshore bank accounts of private businessmen and government officials under the guise of energy contracts.[80]

Local content requirements, introduced in policies to help establish a national energy industry, often cement the position of these rentier elite. These policies thus facilitate rent seeking by the elites, who have access to capital which enables them to access contracts.

76 CIP & AWEPA (2013).
77 EITI (2015).
78 Ng'wanakilala (2014).
79 (ibid.).
80 *The Guardian* (2014).

Second, if global oil prices are unfavourable and exports are not profitable, the reserves are likely to be stranded, while countries continue to depend on energy imports. An example of this comes from Namibia. Only 30% of the country's population has access to electricity.[81] Electricity shortages touched 40% of peak demand in 2013.[82] Yet the Kudu gas field remains stranded.[83] One estimate suggests that using this gas to power domestic combined cycle gas plants could generate over 50% of the country's electricity needs in 2013 (see Figure 3), thereby replacing 80% of unsustainable electricity imports.[84] This gas could also be used to increase the capacity of electricity available in the SAPP and therefore to enhance utility-scale electricity access for countries in the region.

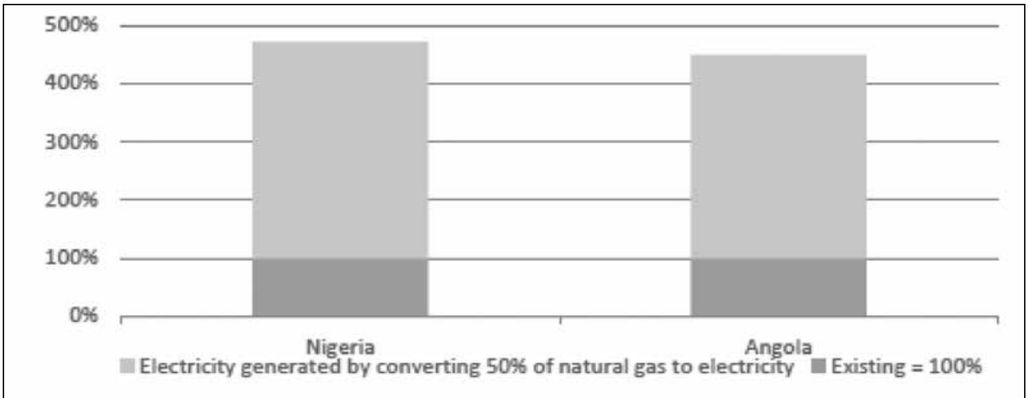

Figure 3: Potential of flared natural gas to increase electricity generation
Source: Pinpoint Energy Namibia Limited, 2011.

It is then not surprising that instead of looking for ways to jointly develop and utilitise their energy reserves for the region's benefits, countries in Southern African are looking to source electricity from the Grand Inga in the Congo River basin in the Democratic Republic of the Congo. The magnitude of requisite electricity transmission infrastructure and the associated costs mean that not only would this electricity be expensive, but also the losses on account of the distance over which electricity will be transmitted would be high.

In terms of the current SAPP plan, the funding required for medium- to long-term projects (until 2025) is in the region of USD83 billion for an additional 57 000 MW. This is more than double the present regional generating capacity, and would also require regional transmission investments of approximately USD6 billion for regional transmissions. South Africa can play a pivotal role in ensuring the bankability of these regional electricity projects, if the country were perceived as a serious buyer of electricity

81 REN21 (2015).
82 Pinpoint Energy Namibia Limited (2011).
83 PwC (2013).
84 Pinpoint Energy Namibia Limited (2011).

and were prepared to provide the initial base load demand. However, South Africa is increasingly making choices that do not exhibit any real commitment to the SAPP.

The 2015 Africa Progress Report makes the following recommendations to address issues relating to governance and management of the energy sector in Africa. Firstly, governments must set out strategies for achieving universal access to energy, aiming at a 10-fold increase in power generation by 2040, while laying the foundations for a low-carbon transition. New technologies, policy reform and innovative business models offer promising pathways. Ethiopia, Kenya, Rwanda and South Africa are already setting examples. Secondly, leaders must tackle vested interests and break the webs of political patronage in energy utilities. Utilities must be required, through legislation, to publish the terms of all off-take arrangements and emergency power-purchase agreements. Tendering should only be done through locally registered and regulated companies.[85] Thirdly, contract and negotiation transparency must be increased in international energy deals, while Africa's renewables revolution must be placed on a transparent and well-managed foundation.

4 Conclusion

The most pressing problem today with regard to sustainability is not that we do not know what to do; rather, the problem is that even though we know very well what to do, we are still not doing it.[86]

Regional energy integration for energy security is not a new idea in Africa. In theory, the enormous regional energy endowments of Southern Africa can be a significant game changer for the region's energy situation and can help to establish a regional energy market. This article places the emphasis on why regional elites should unite around a unique approach to energy integration which can deepen intraregional trade among member states. Such an approach holds not only the promise of energy security, but also new openings for regional manufacturing and commerce on the back of cheap energy. Greater intraregional energy trade can potentially encourage the development of regionally appropriate technologies, complementary regional industrial policies, as well as the production of goods more suited to the regional consumption patterns[87] – and, more ambitiously, new energy production regimes, patterns and infrastructures. Instead Southern African countries have followed rentier behaviour, relying on rents, both external and internal, to pursue self-interest at the cost of energy integration and development opportunities.

It then remains to be seen what choices governments will make in growing the energy sector; which fuel combinations they will choose to invest in and prioritise; and what the impacts of such choices will be, given the political reality of near universality of rentier behaviour in Africa.

85 Jarret (2015).

86 Mamdani (undated), cited in Khan (2013).

87 Cleary (1995).

Southern Africa is no different. This means that the recently energy-rich countries in Southern Africa will be more concerned with the exploitation of energy reserves in a manner that allows for rents for state power elites. As evidence from elsewhere in Africa suggests, the region is likely to be continually plagued by inadequate quantity, poor quality and low access to modern energy. As individual countries export their energy reserves to countries outside the region, the region as a whole is likely to continue to import oil and gas from outside and depend on charcoal, wood and paraffin to meet its fuel supply needs, not only in rural areas but also in urban areas where energy supply is not keeping up. What is worse is that the opportunity to utilise these reserves to develop a regional industrial and commerce base will be squandered.

Changing this to achieving collective energy security will require a fundamental restructuring of governance and capital flows. This will necessitate a policy that is actively oriented towards development. Under such a policy, the economy will no longer be centred solely on the energy sector, but will be supported by it. Paradoxically, the power to undertake such a restructuring lies with the rentiers themselves, who with access to energy rents may prefer to increase their hold on power. While long-term regional energy planning, and transparency over the allocation of rights to energy reserves and revenues generated from these reserves and their use will be key, the achieving of true regional energy integration and security will require the building of stronger, more efficient and well-functioning institutions that by their very nature will work to dismantle the patronage and rent-seeking which is occurring at the expense of the majority of the population.

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ANNEX: RECOMMENDATIONS BY THE NAMIBIAN COMMITTEE ON ECONOMICS, NATURAL RESOURCES AND PUBLIC ADMINISTRATION

The Standing Committee on Economics, Natural Resources and Public Administration discussed the recommendations made during the conference and hereby recommends that Parliament discuss and adopt the following recommendations for implementation by the relevant institutions.

The Standing Committee, cognisant of the pivotal importance of Namibia's energy sector and its role in driving the development of the country, and realising the particular challenges faced by Namibia's electricity sector and with input from a broad cross-section of energy sector stakeholders, local and international experts and members of the public, resolve as follows:

i) that *generally*, Namibia's considerable vulnerability to a changing climate is recognised in both policy development and the revision of national policies, and that vulnerable sectors that specifically include the country's water, agriculture and energy sector must take explicit action to mitigate against such impacts and change legislation, regulations and processes to allow the nation to better adapt to such external factors;

ii) that the *Ministry of Mines and Energy* draft a Renewable Energy and Energy Efficiency Policy and an associated renewable energy law as a matter of urgency;

iii) that the *Ministry of Mines and Energy* draft an Implementation Strategy and Action Plan (social, economic and environmental impacts of RE);

iv) that the *Ministry of Mines and Energy* avail net metering for domestic solar photovoltaic installations across all electricity distribution and supply entities in the country, except if these do already offer a reasonable feed-in tariff for such systems, and that appropriate legislation and regulation is finalised as a matter of urgency;

v) that renewable energy feed-in tariffs (REFIT) must be finalised and operationalised as a matter of priority by *the Electricity Control Board*;

vi) that the *Ministry of Mines and Energy* introduce the necessary financial mechanisms to allow all domestic residences to be fitted with a solar water heater;

vii) that the Ministry of Mines and Energy in collaboration with the Ministry of Trade and Industry carry out an assessment on the viability and requirements of initiating local solar water heater assembly or manufacturing plants, and this must be included under the Ministry of Trade and Industry's promotion of local value addition priorities;

viii) that the *Ministry of Mines and Energy* develops national energy efficiency standards and that *Government* takes the lead in implementing these in all Government institutions and public buildings;

ix) that the *Ministry of Mines and Energy* put forward explicit national renewable energy targets as well as energy efficiency targets, focusing on both the country's transport sector, which is the single largest user of liquid fuels, as well as on technologies requiring electricity for their operation;

x) that the Ministry of Mines and *Energy* lay down the relevant criteria for the definition and measurement of the productive use of energy in general, and electricity in particular, and that relevant activities and measures are formulated to reduce Namibia's energy intensity and promote the uptake and focus on the productive use of sustainable energy and energy efficient technologies for the sustainable development of the country;

xi) that the *Ministry of Education* ensure that sustainable energy is included in school curricula to emphasise the importance of sustainable energy for future generations; and

xii) that the Ministry *of Regional and Local Government, Housing and Rural Development* ensure that all Government housing programmes includes energy efficiency and renewable energy applications at the planning phase.

Energy security is one of the most important future challenges on the international agenda of security, peace and stability worldwide. The escalating demand for energy and the imperative of energy independence are playing a mounting role in politics – and eyes are turning to Africa as the continent with the highest potential for renewable (and other) energy resources for the future.

Energy security is the *sine qua non* in stabilising democracy and economic growth, and in reducing poverty and the impacts of climate change. This timely publication investigates energy security and renewable energies in sub-Saharan Africa, pointing out practical opportunities and regulatory challenges from the perspective of various African and international experts.

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