Division Environment and Infrastructure
TERNA Wind Energy Programme

Energy-policy Framework Conditions for Electricity Markets and Renewable Energies

21 Country Analyses

Eschborn, June 2004

Part South Africa

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PO Box 5180
65726 Eschborn
Germany
Internet: http://www.gtz.de

Edited by:
Dr. Jens Drillisch
Tel. +49 (0)6196 79-1380
E-mail: jens.drillisch@gtz.de

Authors:
Dipl.-Ing. Detlef Loy (responsible),
LOY ENERGY CONSULTING, Berlin; www.loy-energy-consulting.de,
Dipl.-Ing. Hinnerk Fütterer, Dipl.-Wirtschaftsgeograph Patrick Jüttemann, Dr. Danyel Reiche

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Verena Siebert

Background to the New Edition

Structural changes in the energy sector, accompanied by liberalisation of the relevant markets, have been continuing in many developing and transition countries in recent years. Growing demand for electricity and the ongoing climate debate are increasing the level of interest in technologies for generating electricity from renewable energy sources in these countries.

The rapid expansion of the use of renewable energy in Germany is a subject that is being followed with interest, even outside Europe. Experience here shows that the creation of a conducive political and economic framework and the implementation of appropriate promotion measures can speed up the exploitation of renewable energy.

The German and European market acts as the motor for a wind energy industry and provides an indispensable background of experience. The level of growth in this sector within Germany has slowed down, however. Project developers are therefore increasingly turning their attention to off-shore schemes, other parts of Europe, and the Mediterranean states. The markets for technologies based on other renewable energy sources are also experiencing growing interest. While it is true that the potential for hydropower, wind power, solar power, biomass and geothermal energy in developing and more advanced countries is often considered to be high, obstacles to entry into this field include insufficient knowledge of the framework conditions prevailing in the energy industry in those countries and a lack of transparency with regard to the prior experience and interests of the national actors.

One of the aims of this third, updated and expanded edition of the study – under a new title – is to facilitate entry into the field of renewable energy. It is based on the previous editions from 1999 and 2002, which were published under the title 'Producing Electricity from Renewable Energy Sources: Energy Sector Framework in 15 [or 12] Countries in Asia, Africa and Latin America'. These studies have been much in demand, not only by suppliers and project developers but also by financing and operating companies involved in renewable energy technologies.

The analyses of the individual countries comprise sections on the respective electricity markets and the actors in those markets, along with information on the energy-policy framework. The policy for promoting electricity generation from renewable energy sources is examined, and the status of the various forms of renewable energy is analysed in detail. The chapters on each country are rounded off by information about rural electrification.

In comparison with the 2002 edition, eleven new countries have been added. The information about a further ten countries has been updated:

New since 2002		**Updated**	
Albania	Philippines	Brazil	India
Bosnia - Herzegovina	Senegal	Chile	Mexico
Croatia	Sri Lanka	China	Morocco
Georgia	Vietnam	Colombia	South Africa
Jamaica	Yemen	Dominican Republic	Tunisia
Pakistan			

Information about Argentina, Cuba, Jordan, Kazakhstan and Turkey is given in the 2002 edition. Analyses of Egypt, Indonesia and Thailand were conducted in the 1999 edition. These previous editions are available in electronic form free of charge from www.gtz.de/wind/english/downloads.html.

Our grateful thanks go to a large number of GTZ staff members and other experts for their help with putting this information together.

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The TERNA Wind Energy Programme

Specialised knowledge and experience are needed to determine what wind energy resources a country possesses and to identify suitable locations. Technical and economic analyses of wind power projects are also impossible without hard information about wind conditions. Such analyses, however, form the basis for the financing and ultimately the successful implementation of a wind farm.

The purpose of the TERNA (Technical Expertise for Renewable Energy Application) Wind Energy Programme, implemented by the GTZ on behalf of the Federal German Ministry for Economic Cooperation and Development (BMZ), is to assist partners in developing and more advanced countries in planning and developing wind power projects. Since 1988 the aim within the TERNA framework has been to lay the foundations for sound investment decisions while at the same time enabling partners to plan and develop further wind power projects in the future.

The TERNA Wind Energy Programme's partners are institutions in developing and more advanced countries that are interested in commercial exploitation of wind power: these include, for example, ministries or government institutions which have the mandate to develop BOT/BOO projects, state-owned or private energy supply companies (utilities) and private enterprises (independent power producers).

TERNA offers its partners know-how and experience. In order to initiate wind power projects, favourable sites must be identified and their wind energy potential ascertained. To do this, wind measurements are normally taken over a period of at least twelve months and wind reports are drawn up. If promising wind speeds are found, the next step is to conduct project studies investigating the technical design and economic feasibility. TERNA also provides advice to partners on matters of finance, thus closing the gap between potential investors and offers of funding from national and international donors. If required, CDM baseline studies can be prepared and advice can be offered to potential operators on setting up an efficient operator structure. In order to ensure as much transfer of know-how as possible, efforts are made to ensure cooperation between international and local experts, for example when preparing the studies.

In successful cases, TERNA initiates investment-ready wind farm projects by this method. TERNA itself is not involved in financing. In addition to the activities that are tied to specific locations, TERNA advises its partners on how to establish suitable framework conditions for the promotion of renewable energy sources.

The prerequisite for promotion by the TERNA wind energy programme is that project development has a realistic prospect of implementation: if the underlying conditions in the electricity sector are sufficiently favourable, and if the proposed wind farm project has a minimum capacity of roughly 20 MW and is situated in a windy area (expected annual average wind speeds of over 6 m/s at a height of 10 m above ground level). Small individual installations or decentralised wind/diesel systems are not normally eligible for promotion, nor are research projects.

Up until 2004, TERNA has been active in over ten countries around the world. In Colombia the first wind farm started operation at the end of 2003 with the help of the TERNA programme. The municipal utility of Medellín built the 19.5MW Jepírachi wind farm on the Guajira peninsula with a total investment volume of some 27 million euros. The 800,000 tons of carbon dioxide saved by the wind farm by 2012 will be documented and sold to the Prototype Carbon Fund (PCF), which will mean additional revenues of around 3.2 million euros for the investor.

The TERNA projects are not financed from the country quotas which the Federal Germany Government agrees with individual partner countries. From the viewpoint of the partner country, therefore, TERNA offers additional funds for wind energy.

Further information on the GTZ's TERNA Wind Energy Programme, the application procedure etc. is available at www.gtz.de/wind or directly from:

Deutsche Gesellschaft für Technische Zusammenarbeit
(GTZ) GmbH
Postfach 5180
65726 Eschborn
Germany

Dr. Jens Drillisch
Tel. +49 (0)6916 79-1380
Fax +49 (0)6916 7980-1380
E-mail: jens.drillisch@gtz.de

Dr. Rolf Posorski
Tel. +49 (0)6916 79-1352
Fax +49 (0)6916 7980-1352
E-mail: rolf.posorski@gtz.de

Dr. Jasper Abramowski
Tel. +49 (0)6916 79-1760
Fax +49 (0)6916 7980-1760
E-mail: jasper.abramowski@gtz.de

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South Africa

Electricity Market

Capacities

In 2002 South Africa's total installed power generation capacity amounted to approximately 43 GW. The South African utility company Eskom is one of the world's largest electricity providers, with an installed net capacity of 39,810 MW (2002). Private electricity producers (chiefly industrial owner-operators, accounting for some 836 MW) and local government utilities (2,436 MW) have additional generating capacities. Peak demand in Eskom's integrated network reached 31,621 MW in 2002. Eskom's total gross capacity amounts to about 42,000 MW, of which 90% is accounted for by coal-fired power stations, 5% by nuclear power stations, and 5% by hydroelectric power stations and gas turbines. The construction of a gas pipeline from Mozambique to South Africa means that in future natural gas will also be established as an important energy source for generating electricity.

The prevailing surplus in supply and resulting excess capacities are expected to last until 2007. According to estimates, South Africa will require additional power station capacity of 20,000 MW up to the year 2025.

Transmission grid

Eskom both owns and operates the transmission grid. The transmission grid encompasses voltage levels between 132 and 785 kV and most of the infrastructure is over 60 years old, indicating that maintenance investment is likely to be necessary in the near future. In addition to the domestic grid, the grid infrastructure for transmitting electricity to neighbouring countries is also to be expanded in future. South Africa is an important member of the Southern African Power Pool (SAPP) and thus has access to low-cost and secure supply sources in the neighbouring countries.[164]

Electricity generation

As is to be expected from its installed capacity, Eskom dominates the power generating market with 95%. In 2002 net electricity generation reached almost 200 TWh.

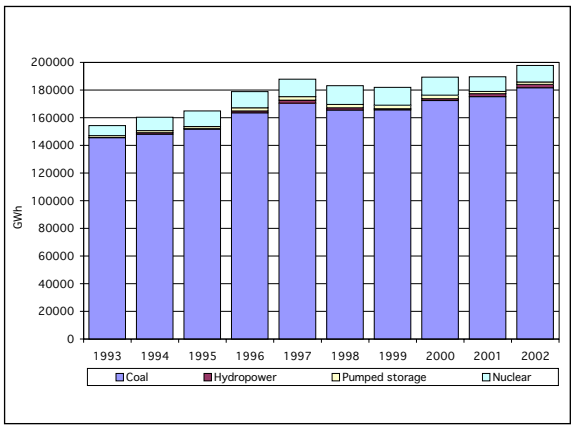

Figure 5: Net electricity generation by Eskom; South Africa; 1993–2002, GWh[165]

There is relatively little importing and exporting of electricity, and figures fluctuate. For instance in 2000 there were net imports of 1.3 TWh (imports: 5.3 TWh and exports: 4.0 TWh), while in 1997 a total of 6.6 TWh was exported and no electricity was imported.

Electricity consumption

In 2001 electricity consumption totalled 181.2 TWh. Between 1990 and 2001 the average rate of growth in electricity demand was 3.1%.

The largest sector in terms of power consumption is industry, in particular mining companies and aluminium producers, accounting for roughly two thirds in the year 2000.

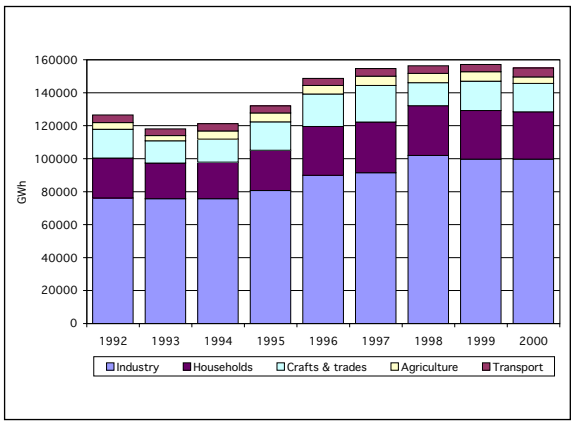

Figure 6: Electricity consumption according to sector; South Africa; 1992–2000; GWh[166]

164 Eskom and other African electricity suppliers plan to build hydroelectric power stations on the River Congo. This river, which has the largest water volume in Africa, has an estimated energy potential of 100 GW. The project includes a 3,000km-long power transmission line through to South Africa.

165 Source: Eskom, Annual Report 2002, and also Digest of South African Energy Statistics available at www.dme.gov.za/energy/pdf/energy_digest_stats.pdf.

166 Source: Digest of South African Energy Statistics, 2002. Department of Minerals and Energy.

Electricity prices

Even if electricity generating costs are among the lowest in the world thanks to the low-cost domestic coal resources available, there are still substantial differences in tariffs between the distribution companies and the various consumer groups.

In 2001 Eskom and municipal utilities charged the following average prices to their customers:

	ZAR-cents/kWh	€ cents/kWh
Agriculture	30.00	3.95
Households	29.49	3.88
Trades & crafts	23.10	3.04
Transport	17.73	2.33
Industry	12.57	1.65
Mining companies	13.40	1.76
Others ('General') [167]	39.03	5.14
Average (volume-weighted)	17.86	2.35

Table 31: Average electricity prices; South Africa 2001, ZAR cents/kWh, € cents/kWh[168]

Market Actors

Eskom

Eskom is the dominant electricity supply company on the African continent. It is responsible for almost all electricity generation in South Africa, for 100% of electricity transmission, and for a large part of electricity distribution.

Independent power producers

Independent power producers still operate on the sidelines at present. Their share in total electricity generation amounts to only about 3%. Producers using renewable energy sources in particular have hardly made any headway in the past due to Eskom's low electricity prices and the lack of any government support. However, the South African Government has announced greater support in the coming years, especially for those private producers who obtain electricity from renewable energies.

Distribution sector

The distribution sector, which comprises Eskom and municipal utilities, is characterised by a large number of actors. However, many of the 237 municipal distribution companies are unable to operate efficiently and cover costs due to the fact that they have only small numbers of customers and low tariffs. In future the distribution sector is to be restructured by means of far-reaching reforms.

Legal Framework

Department of Minerals and Energy (DME)

The Department of Minerals and Energy (DME), as the responsible ministry, is the most important political institution for the electricity sector.

National Electricity Regulator (NER)

The National Electricity Regulator (NER), an institution established in 1987, is responsible for regulating the electricity sector in South Africa. The NER managing board appointed by the DME works independently. The core task of the NER is to issue licences for electricity transmission, distribution and generation[169] and to monitor and authorise tariffs. As of mid-2004 the authority will be responsible not only for the electricity sector, but for all sources of grid energy, in other words for oil and gas too.

White Paper on Energy Policy

The White Paper on Energy Policy presented by the government in December 1998 sets out the most important energy policy goals and is at the same time the fundamental strategy paper for liberalising and privatising the electricity sector. Its core points are the free choice of electricity supplier by customers, the introduction of competition, especially in the generating sector, greater participation of the private sector, and open, non-discriminating access to the transmission system.

Reform of Eskom

The privatisation and unbundling of Eskom is set out in a legal framework plan of the Ministry of Public Enterprises[170]. Since July 2002 Eskom has been operating as a joint stock company, in which electricity generation, transmission and distribution form separate business divisions. In a next step Eskom is to dispose of 30% of

167 This category also includes street lighting and exports by the distribution companies.
168 Source: National Electricity Regulator: Electricity Supply Statistics 2001.
169 Electricity producers need a licence if they sell more than 5 GWh of electricity per year or have a plant capacity in excess of 500 kW.
170 'Policy Framework: An Accelerated Agenda towards the Restructuring of State–Owned Enterprises', August 2000.

its generating capacity by 2006 and will not be permitted to build up any new capacities for the time being[171]. In the long term the transmission grid is to be transferred to an independent, state-owned enterprise.

Sapex trading platform

The electricity sector is to be characterised by a multi-market model in future, in which transactions between electricity generators, traders and buyers can take place on several platforms. It was announced that the SA Power Exchange (Sapex) will be created for this in 2004. In addition to direct electricity transactions between generators and buyers (over the counter), Sapex will also support other forms of trading, for instance via brokers.

Reform of the distribution sector

According to a decision taken by the government cabinet in May 2001 the distribution level will be restructured, so that in future only six Regional Electricity Distributors (REDs) with a uniform tariff structure will distribute electricity to final customers. As a result of differences of opinion, especially regarding participation and/or compensation of municipal utility companies, implementation of the reform has come to a halt for the time being. The final version of the Electricity Distribution Industry Bill can only be submitted to the cabinet for signature after the parties have reached an agreement.

Clean Development Mechanism

South Africa joined the Kyoto Protocol in July 2002, but has not yet ratified this finally. The great significance of coal in electricity generation and the resulting emissions offer good conditions for CDM projects. The Department of Environmental Affairs and Tourism (DEAT), which is responsible for climate policy, and the national CDM authority within the Department of Trade and Industry (DTI) are showing great interest in deploying CDM as an incentive mechanism for foreign investment. Promising potential applications are seen above all in small-scale projects in the area of renewable electricity generation.

Policy for Promoting Electricity Generation from Renewable Energy Sources

Since 1994 there has been notable promotion of renewable energy sources for electricity generation, chiefly within the framework of electrification programmes for rural areas in conjunction with off-grid applications. At present there are no special rules for supplying and paying for electricity from renewable energy sources.

White Paper on Renewable Energies

According to the White Paper on Energy Policy, the South African Government aims to introduce focused promotion for the development, demonstration and implementation of renewable sources of energy for applications on a small and a large scale. These plans are set out in concrete form in the White Paper on Renewable Energies that was adopted in November 2003. Here the Government has set itself the expansion target of producing 10 TWh of electricity from renewable energy sources by 2013. In addition to announcing financial incentives to be provided by national and international programmes, the Paper calls for development of a comprehensive regulatory framework including appropriate tariff structures. It is expected that a strategy paper for implementation will be published in 2004.

The White Paper envisages a tendering model with long-term power purchase agreements as a promotion system for generating electricity from renewable energy sources. The NER is to devise the specific framework.

Market for green electricity

The NER as the regulator has announced that it will develop a 'green electricity market'. Producers will be awarded certificates to distinguish electricity generated from renewable energy sources.[172] The electricity can be purchased voluntarily by authorised customers who are willing to pay the additional charge compared with normal electricity tariffs. However, international experience shows that no sustainable market growth can be created by voluntary demand for 'green' electricity.

171 10% of the generating capacity is to go to enterprises owned by black South Africans within the framework of 'black economic empowerment'.
172 www.ner.org.za/gwatts/green_watts_certificates.htm.

SABRE-Gen Programme

In 1998 Eskom launched a programme to investigate the potential applications of renewable energy sources for grid-coupled electricity generation on a large scale and to test these in demonstration projects. The South African Bulk Renewable Energy Generation (SABRE-Gen) Programme has four components:

- use of biomass (SABRE–Gen – BioEnergy)
- generation of solar thermal electricity (SABRE-Gen – Solar Thermal Electric)
- use of offshore wave energy (SABRE–Gen – Wave)
- use of wind energy (SABRE–Gen – Wind).

Central Energy Fund and support by international donors

In addition to international financial donors such as the World Bank and GEF, financial aid also comes from the national level. The funding offered by the Central Energy Fund is to be focused more on renewable energies in this connection. The Central Energy Fund (CEF), set up in 1997, aims in particular to establish universal access to modern forms of energy, to increase the use of renewable energies, and to develop a local gas market.[173] Further financial aid is offered by the DME, the Development Bank of Southern Africa, the Industrial Development Corporation, and the Department of Trade and Industry.

Danish-South African programme

The four-year Capacity Building Project in Energy Efficiency and Renewable Energy (CaBEERE) was launched in August 2001 in cooperation between the South African and Danish governments. In addition to developing strategies for disseminating renewable energies and possible implementation measures on a policy level, the programme focuses on implementing concrete projects, building up a database with service enterprises, and preparing fundamental sector studies.[174]

Prospects of a World Bank project

An application has been submitted for a World Bank project entitled 'Renewable Energy Market Transformation' (REMT). In addition to institutional empowerment, this focuses on grid-coupled electricity generation and electricity production in the sugar and paper industries for in-plant use. A large proportion of the financial resources is to come from the Prototype Carbon Fund (PCF).[175]

Status of Renewable Energy Sources

Renewable energies currently account for approximately 10% of South Africa's primary energy production. The most significant element within this is the traditional use of biomass (for example firewood) as fuel for cooking and heating.

Renewable forms of energy (mainly hydropower) only contribute just under one per cent to the country's electricity generation. In South Africa renewable energy sources are used primarily in off-grid installations. The lack of a promotion culture and the low cost of generating electricity from coal have proved to be the main obstacles preventing the use of grid-coupled systems.

Hydropower

In 2001 the installed capacity amounted to 668 MW, of which Eskom produced 661 MW. Of the six small hydroelectric power stations (< 10 MW) with a total capacity of 15 MW, two were owned by Eskom and three by municipal utilities. The only private small hydroelectric power plant has a capacity of 3 MW.[176] The total installed capacity of mini hydropower systems is estimated at 0.4 MW.

Hydropower potential

Low precipitation, often only seasonal watercourses and frequent droughts and flooding restrict the potential for hydropower.[177] The realisable potential for hydroelectric power plants with a capacity of less than 50 MW is approximately 9.9 TWh. Potential locations for micro hydropower systems, which are chiefly located on the Eastern Escarpment, are quantified at 3500–5000.[178]

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173 For further information see www.cef.org.za.

174 For further information see DME under www.dme.gov.za.

175 The financial volume amounts to US$ 165 million. Of this, US$ 103 million is to be provided by private sources, US$ 6 million each by GEF and the South African Government, and US$ 50 million by the PCF.

176 This private plant is located in Nelspruit in the province of Mpurnalanga and has proved to be a cost-effective, profitable project.

177 Further information on potentials and resources is available in the South African Renewable Energy Resource Database (SARERD): www.csir.co.za/environmentek/sarerd/index.html.

178 Source: DME: Green Power-Business Opportunities in South Africa for Renewable Energy Independent Power Producers. 2003. In the White Paper for Renewable Energies the potential is stated as 11 TWh.

At present there are no special promotion programmes for hydropower. In isolated cases small plants are promoted within the context of rural electrification. It remains to be seen to what extent the strategy announced for 2004 of promoting renewable energies contains specific hydropower components.

Wind Energy

The potential for wind energy is good, especially in the area of the long coastal strip and inland escarpments. DME published a wind atlas for the first time in 1995. Measurements were conducted in Eastern Cape Province with EU support at the end of the 1990s. An average wind velocity of 6 m/s was measured at a number of different locations. At Cape Point average peak wind speeds of 9 m/s were recorded. A new wind atlas based on detailed data is being drawn up by Eskom within the framework of the SABRE-Gen Programme. The annual wind energy potential is estimated at 26 TWh.[179]

Installed and planned wind farms

At present only one Eskom pilot wind farm in Klipheuwel, 50 km from Cape Town, consisting of three wind turbines from different manufacturers (rated at 660, 750 and 1,750 kW) feeds electricity into the integrated network.[180] Otherwise wind power plants are used to generate electricity in small village grids (total approximately 45 kW) and off-grid individual systems (altogether roughly 500 kW).[181]

A first relatively large pilot wind power project near Darling (on the west coast) with a capacity of 5.2 MW is at an advanced planning stage. With a mean wind speed of 7.5 m/s at an elevation of 50 m and a capacity factor of 30%, annual electricity production is estimated to be 13 GWh. A power purchase agreement with the city of Cape Town was signed in December 2002. Preliminary investigations are also being conducted at a former military location on Langefontain Farm. It is being considered whether to install 50 turbines of the 2.3MW class there.[182] In addition to these major projects the use of small wind power facilities in mini grids, often in hybrid operation with PV or diesel systems, is also being investigated.[183]

Promotion

With the exception of the SABRE-Gen Programme, which focuses on researching the integration of large wind power plants into the national electricity grid, there are currently no notable national promotion programmes or incentive systems for wind power plants.

UNDP/GEF wind energy programme

The use of wind power in South Africa is accordingly still at the pilot or demonstration phase. With the aid of international organisations a promotion framework for grid-coupled wind power plants is now to be developed. This is the approach being taken by the UNDP/GEF's South Africa Wind Energy Programme (SAWEP) that is being implemented in cooperation with the Danish organisation DANCED (Danish Cooperation for Environment and Development). It focuses on policy consultancy in respect of a regulatory environment for independent electricity generation, the development of financing mechanisms, and support for local project developers.

Biomass

Measured against total primary energy production, biomass in the form of fuel wood, wood wastes, dung, bagasse and charcoal ranks very high. These energy sources contribute 60% to the energy consumption of private households.

So far only sugar cane bagasse is of any relevance in electricity generation. In 2001 it accounted for 300 GWh or 0.15% of total electricity generation. Bagasse is used to fuel combined heat and power stations directly in the sugar factories. The electricity produced here is largely used within the plants and only a small part is fed into the grid. In 2001 five bagasse-fired plants with a total capacity of 105 MW had licences; all were owned by independent power producers.

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179 Source: Database SARERD, www.csir.co.za/environmentek/sarerd/index.html.

180 See also: Smit, Riaan: Eskom's first wind energy experiences at Klipheuwel, 2003.

181 Traditionally wind energy is mainly used in windmills for pumping water. Currently over 20,000 such installations are in operation and with approx. 12 MW account for three quarters of the installed capacity. See DME-Department of Minerals and Energy: Baseline Study on Wind Energy in South Africa; Final Report; Capacity Building in Energy Efficiency and Renewable Energy Program; February 2003.

182 See also DME: Baseline Study on Wind Energy in South Africa; Final Report; Capacity Building in Energy Efficiency and Renewable Energy Program; February 2003; or also Winkler, Harald: Renewable energy policy in South Africa: policy options for renewable electricity; Energy Policy; online version 2003.

183 This includes the Lubisi Dam Community Project, in which two imported 2.2kW small wind power systems were installed in combination with PV systems. In the Hluleka Nature Reserve two 2.5kW wind power installations together with PV systems and diesel generators support the electricity and water supplies to a small settlement.

Biomass potential

At present only about a quarter of the electricity generation potential of bagasse is exploited.[184] In addition, wastes from sawmills and paper factories could contribute 7,600 and 4,500 GWh respectively to electricity supply. The annual energy potential of harvest residues is 341 GJ, and residues from livestock breeding could contribute some 5,600 GWh to electricity production.[185]

The White Paper on Renewable Energies discusses implementing a promotion framework for biogenic fuels. A 30% tax rebate for bio-diesel is being considered.

Biogas

So far there has been hardly any production of biogas from waste water or solid wastes, but this option certainly has potential. The energy content of the domestic and industrial solid wastes generated in 1990 amounted to 40.5 PJ. Methane gained from sewage could contribute 36 MWh annually to electricity supplies.

The portfolio of the World Bank's Prototype Carbon Fund (PCF) includes a South African landfill gas project. In the city of Durban CO_2 certificates will be earned following successful completion of a project converting methane gas from three landfill sites into electricity, and sale of these certificates to the PCF has been agreed contractually. Turbines with a rating of up to 10 MW are to be used.[186]

GTZ ProBEC programme

The GTZ programme for saving biomass (ProBEC) has also been in operation in South Africa since 1998. The goal of ProBEC is to meet the energy requirements of low-income population groups in a socially sustainable and environmentally sound manner. For instance, ProBEC supports private-sector activities for producing and marketing energy-efficient technologies and techniques for cooking and heating.[187] On the basis of the success achieved to date, further international donors are providing additional funds for the project.

Over and above the GTZ activities, isolated biomass applications are promoted within the framework of the state support for rural electrification, such as sewage-based biogas recovery in rural schools. Resource potentials and possible applications of biomass technologies are being determined within the framework of the SABRE-Gen Programme by Eskom.

Solar Energy

With average daily solar irradiation of 4.5 to 6.5 kWh/m^2, South Africa is excellently equipped for solar energy applications. The solar radiation values were recorded in a database and published on a map.[188]

The total installed PV capacity is approximately 12 MW_p, of which only about 150 kW is attributable to grid-connected systems. In addition to solar home systems (SHSs), distributed facilities are used for telecommunications and water pumps as well as for schools and hospitals.

The provision of small PV systems for isolated supply units in areas that cannot be cost-effectively connected to the national grid represents an essential element of the promotion programme for the electrification of rural regions.

Concession programme and 350,000 solar home systems

At the beginning of 1999 a promotion programme was launched to install a total of 350,000 SHSs. In each of seven regions, 50,000 systems are being installed and serviced by a private concessionaire for each region who will be identified through a call for tenders. Half of the investment costs are being covered by subsidies.

One of the concessionaires is the Shell-Eskom joint venture.[189] In a first phase this joint venture tackled the electrification of 6,000 households in Eastern Cape Province during 1999 and 2000. Of these 6,000 systems, 4,700 were still in operation in 2002. The 'Powerhouse Systems' are made available to the households for a one-off payment of ZAR 150 (€ 19.75). The users have to buy a magnetic card costing about € 7 to activate the system. The credit volume on the card is used up after

184 Each year some 7 million tons of bagasse are produced. Given an output of 200 kWh/t achieved using modern combined-cycle power plants, the calculated potential would be 1,400 GWh.

185 See SARERD, www.csir.co.za/environmentek/sarerd/index.html.

186 See United Nations Industrial Development Organization (UNIDO): CDM Investor Guide South Africa, 2003.

187 Sub-components of the programme comprise the use of more energy-efficient technologies, cost-effective production and marketing of such items of equipment, the use of alternative, renewable sources of energy, more efficient fuelwood management, and improved kitchen management. For further information see www.probec.org.

188 www.csir.co.za/environmentek/sarerd/index.html.

189 The other concessionaires to date are: Electricité de France – Total Fina Elf Consortium, Nuon-Raps (Netherlands, South Africa), Solar Vision (PTY) Ltd and Renewable Energy Africa (Pty) Ltd.

about 30 days and the card has to be recharged. The fees include complete maintenance of the system, including battery changing. However, socio-economic and technical factors have impeded smooth running of the system.[190]

KfW is contributing € 15.9 million to the investment costs for 27,000 SHSs in the areas of Eastern Cape and North West Province. The concessionaire will be selected in an international call for tenders to be conducted at the beginning of 2004.

Eskom plans to carry out non-grid-coupled electrification of 16,400 schools and some 2,000 hospitals by 2005. The schools are to be equipped with an average PV rating of 500 W, while larger systems are planned for rural hospitals.[191] Financing will be realised via national and international promotion.

GTZ solar cooker field test

The GTZ conducted a pilot project on solar cookers in South Africa between 1998 and 2003. The core task of the project was to clarify possibilities and conditions for using selected solar cookers, and to achieve greater clarity about how this new cooking option was accepted by potential target groups (field test). The results of the field test were supplemented by a broad-based market potential study conducted in cooperation with UNDP-GEF, which confirms that market potential is substantial. The results and a business case were presented to various organisations, including the Central Energy Fund (CEF). CEF thereupon took a decision in favour of intensifying activities on the way to commercialisation.

Rural Electrification

Degree of electrification

While only one third of households enjoyed electricity supplies in 1994, by the end of 2002 the share had risen to two thirds. However, some 7.3 million South African households are currently still without access to electricity. Most of the non-electrified households are located in the provinces of KwaZulu Natal and Eastern Cape.

	Rural	Urban	Total
Population	21,565,933	23,888,278	45,454,211
Households	4,436,604	6,547,045	10,983,650
Electrified households	2,231,924	5,225,063	7,456,987
	50.3%	79.8%	67.9%
Non-electrified households	2,204,680	1,321,982	3,526,663
	49.7%	20.2%	32.1%

Table 32: Electrification, South Africa; 2002; absolute and %[192]

2.5 million connections in 5 years

Following the end of apartheid, one of the world's most ambitious and successful electrification programmes was started in South Africa. A National Electrification Forum (NELF), set up by the new government in 1993, formulated the goal of creating 2.5 million new household connections between 1994 and 1999, as well as of electrifying all schools and hospitals. A large proportion of the electricity provision close to conurbations was to be effected by connecting households to the grid, while localised solutions on a large scale were envisaged above all for rural regions. Within the framework of the Reconstruction and Development Program (RDP) these figures were even exceeded.

INEP

The Integrated National Electrification Programme (INEP) unites the electrification measures of NER and Eskom. It has been running since 2001, with the DME taking over responsibility in April 2002. The aim is to provide all households with access to electricity within a period of 10 years. The electrification programme is being financed by international donors and via the National Electrification Fund, which is fed directly from the national budget and is watched over by the DME.

Free basic electricity supply

On the basis of pilot projects and studies, Eskom is reviewing whether to introduce a free basic electricity supply in rural areas, currently dimensioned at 50 kWh per household and month.

Exchange rate (02 Dec. 2003): 1 rand (ZAR) = 100 cents = € 0.132

190 The many thefts and a lack of willingness to pay have proved problematic. Furthermore, the prepaid card technique proved to be complicated and liable to faults. Shell is considering a new distribution model (Neue Energie, 09/2003, p. 110).

191 The electrification programme for rural hospitals with renewable sources of energy is being headed by the Independent Development Trust (IDT).

192 Source: National Electricity Regulator: Lighting up South Africa 2002.

Information Sources

- CDM Executive Board: The Clean Development Mechanism. A guide for potential participants in South Africa. September 2002
- DME – Department of Minerals and Energy: Baseline Study on Wind Energy in South Africa. Final Report. Capacity Building in Energy Efficiency and Renewable Energy Program. February 2003
- DME – Department of Minerals and Energy: Green Power – Business Opportunities in South Africa for Renewable Energy Independent Power Producers. 2003
- DME – Department of Minerals and Energy: White Paper on the Promotion of Renewable Energy and Clean Energy Development. Part One – Promotion of Renewable Energy. Draft. August 2002
- Eberhard, A.: The political, economic, institutional and legal dimensions of electricity supply industry reform in South Africa. At Conference 'The Political Economy of Power Market Reform', Standford University, CA, US, February 2003. + Business Report (www.busrep.co.za): '2004 will usher in rival to Eskom', 21 Decembre 2003.
- EIA – Energy Information Administration: South Africa. September 2002. www.eia.doe.gov
- Eskom: Annual Report 2002
- EU Synergy Programme: Accelerating the Market Penetration of Renewable Enery Technologies in South Africa, Action Plan Summary. March 2001
- Fossil Energy International: An Energy Overview of the Republic of South Africa. Last updated on October 20, 2003
- Karottki, Schäffler, Banks: Wind Energy in South Africa – time to implement. Renewable Energy World, May-June 2001
- NER – National Electricity Regulator. Annual Report 2002/2003
- NER – National Electricity Regulator: Electricity Supply Statistics 2001 for South Africa.
- NER – National Electricity Regulator: Lighting up South Africa 2002
- Pew Center on Global Climate Change: Climate Change mitigation in developing countries. October 2002
- Schäffler, Jason: Wind Energy in South Africa. Time to implement? South Africa Wind Energy Association
- Spalding-Fecher, R: Indicators of stustainiability for the energy sector: a South-African case study. Energy for Sustainable Development (Journal of the International Energy Initiative), Volume 1, Issue 1, March 2003
- United Nations Industrial Development Organization (UNIDO): CDM Investor Guide South Africa, 2003
- Winkler, Harald: Renewable energy policy in South Africa: policy options for renewable electricity. Energy Policy. Online version 2003

Contact Addresses

Department of Minerals and Energy
DRC Synodal Centre
234 Visagie Street
Private Bag X59
Pretoria 0001
Tel. 0027 (12) 317-90 00
Fax 0027 (12) 322-34 16
www.dme.gov.za

National Electricity Regulator NER
PO Box 40343
Arcadia 0007
Tel. 0027 (12) 401 4600
Fax 0027 (11) 401 4700
E-mail: info@ner.org.za
www.ner.org.za

GTZ Office Pretoria
PO Box 13732
Hatfield 0028
Tel. 0027 (12) 3420181
Fax 0027 (12) 3420185
E-mail: gtz-suedafrika@za.gtz.de
www.gtz.co.za/

SAWEA South African Wind Energy Association
P.O. Box 837
Sunvalley 7975
Tel. 0027 (21) 789 2009
E-mail: sawea@icon.co.za
www.icon.co.za/~sawea

South African National Energy Association (SANEA)
Suite 121
PostNet RAU Private Bag X12
Melville 2109
Tel. 0027 (11) 489 2173
Fax 0027 (11) 489 2153

Energy and Development Research Centre (EDRC)
University of Cape Town
Private Bag
Rondebusch 7701
Tel. 0027 (21) 650 3230
Fax 0027 (21) 650 2830
E-mail: energy@energetic.uct.ac.za
www.edrc.uct.ac.za/edrc/

ESKOM
Megawatt Park
PO Box 1091
Johannesburg 2001
Tel. 0027 (11) 800 8111
Fax 0027 (11) 800 4338
E-mail: PAIA@eskom.co.za
www.eskom.co.za/

Central Energy Fund (CEF)
6 Protea Place
Sandown
PO Box 786141
Sandton 2199
Tel. 0027 (0)11 535-7000
Fax 0027 (0)11 874-0472
www.cef.org.za

Solar Energy Society of Southern Africa (SESSA)
PO Box 152
La Montagne 0184
Tel. 0027 (12) 804 3435
Fax 0027 (12) 804 5691
E-mail: info@sessa.org.za
www.sessa.org.za/

Southern African German Chamber of Commerce and Industry Ltd.
PO Box 1272
Cape Town 8000
Tel. 0027 (21) 422 3311
Fax 0027 (21) 422 5577
E-mail: capetown@sagc.co.za
www.sagc.co.za

Development Bank of Southern Africa
PO Box 1234
Halfway House,
Midrand, 1685
Tel. 0027 (11) 313 3911
Fax 0027 (11) 313 3086
www.dbsa.org

Industrial Development Corporation
PO Box 784055
Sandton 2146
Tel. 0027 (11) 269 3000
Fax 0027 (11) 269 3116
www.idc.co.za

Department of Trade and Industry
Private Bag X84
Pretoria 0001
Tel. 0027 (11) 254 9405
Fax 0027 (11) 254 9406
E-mail: contactus@thedti.gov.za
www.dti.gov.za/

The potential of renewable sources of energy in developing and emerging countries is often considered high. Obstacles to their exploitation and foreign investors' engagement often include a lack of knowledge of framework conditions in the energy industry and insufficient transparency with regard to the prior experience and interests of the national actors. These are barriers which this third, updated and expanded new edition intends to overcome.

The **electricity markets** and their respective **actors** are investigated for **21 countries** in various regions: **Latin America – Caribbean, Africa, Europe – Caucasus** and **Asia – Pacific.** The country reports analyse the **energy-policy framework conditions** and closely examine the **status** of and **promotion policy** for electricity generation on the basis of **hydropower, wind power, solar power, biomass** and **geothermal energy**. The chapters on each country are rounded off by information about **rural electrification**.

Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH

Dag-Hammarskjöld-Weg 1-5
Postfach 51 80
65726 Eschborn
Telefon (0 61 96) 79 - 0
Telex 4 07 501- 0 gtz d
Telefax (0 61 96) 79 -11 15
Internet: http://www.gtz.de

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