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TERNA Wind Energy Programme

Energy-policy Framework Conditions for Electricity Markets and Renewable Energies

23 Country Analyses
Chapter Namibia

Eschborn, September 2007

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New Edition of the TERNA Country Survey

Since the first edition of the TERNA country survey appeared in 1999, there has been a distinct heightening of public and political awareness of the consequences of climate change and of energy provision as a key factor in sustainable development. In Germany and other industrialised countries, a political tailwind, effective promotion mechanisms and rising energy prices have created the conditions for a dynamic market in which renewable forms of energy are exhibiting high growth rates within the energy mix. In 2006, global new investment in renewables amounted to US$ 70.9 billion – an increase of 43 % over 2005.

Strong economic development in many emerging countries has triggered rapidly rising demand for energy and competition on the international oil market. Against the background of the rising cost of fossil fuels, supply risks and damage to the environment, the significance of renewable energy as a means of generating electricity is growing – also in developing and emerging countries: according to analyses conducted by the Renewable Energy Policy Network for the 21st Century (REN21), 39 countries have set expansion targets for renewable energy sources and introduced promotion mechanisms, nine of which are developing or emerging countries. Of total new investment in renewable energy around the world, US$ 15 billion was invested in developing and emerging countries. Nevertheless, the majority of countries still have a long road ahead of them before they overcome existing barriers to the successful introduction of renewable forms of energy.

The German and European market acts as the driving force for the wind energy industry and provides an indispensable background of experience. However, growth in the industry is also increasingly apparent in developing and emerging countries. It is the successes in countries such as India, China and Brazil which encourage commitment beyond the borders of industrialised nations. In those three countries there is a growing proportion of local content in the systems and equipment they produce – and not only for supply to their own domestic markets.

A number of other countries though, too, are erecting their first wind farms, thereby establishing the basis for gaining experience to be utilised in future markets.

To help interested players gain access to the new markets, this survey provides detailed descriptions of the framework conditions for electricity markets and renewable energy in 23 developing and emerging countries.

Latin America	Africa/Middle East	Asia
Argentina	Egypt	Bangladesh
Brazil	Ethiopia	China
Caribbean States	Jordan	India
Chile	Morocco	Indonesia
Colombia	Namibia	Pakistan
Costa Rica	South Africa	Philippines
Dominican Republic	Tunisia	Viet Nam
Mexico		
Nicaragua		

This latest country survey and the previous editions are available on our homepage: www.gtz.de/wind. For the first time, the publication is also available on CD-ROM. For information on how to obtain this, again, go to the homepage.

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

Eschborn, September 2007

Legal Information

1. The data used in this study is based on both publicly accessible sources of information (publications, specialist articles, internet sites, conference papers etc.) and non-public papers (for example internal expert reports from promoting institutions), as well as personal interviews with experts (for example officials at energy ministries in the investigated countries and project staff at promoting institutions). Although all information has been checked as far as possible, errors cannot be ruled out. Neither the GTZ nor the authors can therefore provide any guarantee of the accuracy of the data included in this study; no liability can be accepted for any loss or damage resulting from use of the data included in the study.

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The TERNA Wind Energy Programme

There is great potential for generating electricity from renewable energy sources in many developing and emerging countries. Obstacles to the exploitation of such sources include a lack of knowledge of framework conditions in the energy industry and insufficient transparency with regard to the prior experience and interests of national actors.

The purpose of the TERNA (Technical Expertise for Renewable Energy Application) wind energy programme, implemented by GTZ on behalf of the Federal German Ministry for Economic Cooperation and Development (BMZ), is to assist partners in developing and emerging countries in planning and developing wind power projects. Since 1988 the TERNA programme has pursued the twin goals of laying the foundations for sound investment decisions while at the same time enabling partners to assess wind energy potentials, plan wind energy projects and improve energy-policy frameworks for renewable forms of energy.

The TERNA wind energy programme's partners are institutions in developing and emerging 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 expertise 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.

Up until 2007, TERNA has been active in over ten countries around the world.

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

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14 Namibia

14.1 Electricity market

Installed capacity

The national power grid in Namibia is fed by three domestic power plants and inputs from neighbouring countries into the interconnected system. With a rating of 249 MW, the Ruacana hydroelectric power station is the largest contributor in terms of domestic capacity. Namibia also has two thermal power stations: the coal-fired Van Eck plant near Windhoek with 120 MW, and the 24 MW Paratus plant near Walvis Bay, which has four diesel generators.

The two thermal power plants were only installed as an interim solution, because the hydropower plant at Ruacana was not completed until much later than planned. Originally it was assumed that Ruacana would be able to provide enough electricity for the entire country. However, since demand for electricity has increased rapidly since then, not only are all three plants still in operation, but roughly half[1] of all electricity consumed in Namibia now has to be purchased from neighbouring countries.

Since the bought-in power from South Africa is less expensive than that generated by the country's own thermal power plants, the latter are only depended on for periods of particularly high demand. The maximum capacity for importing electricity from neighbouring interconnected grids amounts to 600 MW. The capacity available within the country has remained unchanged since 1999, and comprises the following elements:

Ruacana, hydropower	249 MW
Van Eck, coal-fired, Windhoek	120 MW
Paratus, diesel generators, Walvis Bay	24 MW
Interconnection with neighbouring grids	600 MW
Total	**993 MW**

Tab. 1: Available capacity, by source; Namibia; 1999–2006; MW[2]

Power generation

No data is available on the proportions of domestically produced and imported electricity with regard to type of plant or source of energy. According to information provided by the national power utility NamPower for 2006, both thermal power plants are kept in standby mode and only actually utilised in exceptional cases to help cope with peak loads. Consequently, it must be assumed that most of the electricity produced in Namibia comes from Ruacana Power Station.

Namibia is a member of the Southern African Power Pool (SAPP), an international, interconnected electrical system representing member countries of the Southern African Development Community (SADC). Power providers in Zambia (ZESCO), Zimbabwe (ZESA), Botswana (STEM), Angola and South Africa (Eskom) all share their generated power with one another. The table below provides an overview of the electricity produced in and for Namibia.

Power production	2001	2002	2003	2004	2005
			GWh		
NamPower (Namibia)	1,211	1,429	1,421	1,379	1,660
Zesco (Zambia)	21	21	21	9	23
Eskom (South Africa)	1,045	921	988	1,423	1,514
Zesa (Zimbabwe)	–	–	–	87	158
STEM (Botswana)	–	–	36	47	8
Total	**2,277**	**2,371**	**2,466**	**2,945**	**3,363**

Tab. 2: Power production for the Namibian grid; 2001–2005; GWh[3]

1 2005: 1703 GWh electricity imported, and 1660 GWh produced domestically.
2 Source: NamPower.
3 Source: NamPower.

Power transmission and distribution

Namibia has a well-developed network of transmission lines radiating out from the capital city of Windhoek to reach all populated areas of the country. The main transmission line extends from north to south, because one of the two main power sources is situated near the northern border (Ruacana Hydro Power Station) and the other is located at the southern border, i.e. the point at which the Namibian grid merges with the South African grid.

Transmission and distribution lines	2001	2002	2003	2004	2005
	km				
400 kV	735	988	988	988	988
330 kV	521	521	521	521	521
220 kV	1,664	1,664	1,958	1,958	1,958
132 kV	1,166	1,388	1,462	1,588	1,656
66 kV and below	13,223	14,194	16,357	20,762	22,072

Tab. 3: Development of the Namibian power transmission and distribution network; 2001–2005; km[4]

In the five-year period between 2000 and 2004, Namibia managed to reduce its power transmission losses from 9.8 % to 5.1 %.

Power consumption

Demand for electricity in Namibia has increased markedly in recent years. The main contributory factors to this was the commissioning of the Scorpion zinc mine in 2004 in the southwest of the country. Together with the associated ore processing facilities, that mine alone accounts for roughly 25 % of Namibia's overall power consumption.

Electricity sold	2001	2002	2003	2004	2005
	GWh				
Namibian users	1,981	2,082	2,117	2,301	2,349
Scorpion zinc mine	–	–	76	471	596
Botswana	2	4	7	8	12
Angola	5	6	10	12	16
Eskom (South Africa)	62	44	36	3	3
Total	**2,050**	**2,136**	**2,246**	**2,795**	**2,976**

Tab. 4: Quantities of electricity sold; Namibia; 2001–2005; GWh[5]

The upward trend in peak loads is attributable to a combination of increasing customer count and, above all, the Scorpion mine commencing operation in 2004.

Peak load	2001	2002	2003	2004	2005
	MW				
Without Scorpion mine	332	348	371	389	400
With Scorpion mine	332	348	371	461	491

Tab. 5: Peak load; Namibia; 2001–2005; MW[6]

4 Ibid.
5 Source: NamPower.
6 Source: NamPower.

Electricity prices

Electricity prices for ultimate consumers in Namibia vary slightly from region to region. The total price comprises a demand rate and an energy rate (unit rate). Some regional providers also levy a monthly service charge, and each purchased kWh of electricity also carries a fee equivalent to 0.048 euro cent (N$ 0.0045) that goes toward financing the Namibian regulatory authority, the Electricity Control Board.

	City of Windhoek	Grootfontein (CENO-RED)	Lüderitz city government
	€		
Private households, 220 V			
Base rate per ampere	0.544	0.259	0.270
Energy rate per kWh	0.037	0.083	0.062
Service charge	–	5.400	–
Industrial users			
Demand rate per kVA	7.559	9.719	9.499
Energy rate per kWh	0.037	0.075	0.045
Base rate	–	32.397	–

Tab. 6: Electricity prices for ultimate consumers, in euros; Namibia; 2006/2007[7]

Local providers set their own prices for their respective service areas but must have them approved by the Electricity Control Board. Once the prices have been approved, they can be viewed at the Board's website.[8]

To date, all providers obtain all their electricity from NamPower, the national power utility, which charges them the equivalent of 0.021 euro/kWh.[9] The last price increase (+ 9.5 %) took effect in July 2005.

Future development and expansion planning

By 2011 the national power utility NamPower is anticipating the peak load to have risen to approximately 600 MW. The South African power producer Eskom, which in the past has supplied a major share of Namibia's electricity needs, has announced that, due to rising domestic demand, its capacities will no longer be available in the future. With that in mind, the Government of Namibia is striving to become less dependent on imported electricity by securing enough generating capacity of its own to satisfy the country's needs. Aiming for an accordingly higher level of self sufficiency, the Government of Namibia had the Ministry of Mines and Energy investigate various options for expanding the domestic generation of power.

It emerged that the first option, building two large dams, would take too long, because it would mean negotiating agreements with neighbouring countries affected by the schemes. Consequently, according to NamPower, it was decided to develop the Kudu natural gas field, which is situated about 130 km off the coast of Namibia. A 170 km-long pipeline will bring the collected gas to Oranjemund, where two 400-MW gas-fired power plants are to be constructed in stages. With that much additional capacity, Namibia would even be able to export electricity to the Southern African Power Pool (SAPP). In December 2006, NamPower announced that construction of the two gas-fired power plants could begin as early as 2007. The first plant is supposed to be up and running by the end of 2010.

7 Source: Electricity Control Board.
8 www.ecb.org.na
9 Source: NamPower price list 2006/2007.

14.2 Market Actors

NamPower

Established in 1964[10], Namibia's national power utility is now a corporation wholly owned by the Government of Namibia. With a staff of roughly 900, NamPower operates the country's three power plants and the national power grid. The company also (still) supplies electricity directly to a number of customers who are situated beyond the reach of local power providers.[11] As a member of SAPP, NamPower buys and sells electricity abroad. The company has set up a special division for that field of business.

Regional Electricity Distributors (REDs)

In the past, Namibia's various municipal authorities organised the local supply of electricity to ultimate users. The respective local governments purchased electricity from NamPower and passed it on to the citizens. Tariffing was left to the local authorities, who sometimes availed themselves of the opportunity to cross-subsidise other public services at the cost of the electricity customers.

Now, however, the Namibian power sector is being restructured – a process that began in 2000 and is to be completed in 2007 - and the municipal power providers are being grouped into five large utility companies. In their respective regions, the utilities have the status of independent enterprises managed according to market-economy principles. They are regulated by the Electricity Control Board, which among other things is responsible for approving ultimate-user prices and setting electricity supply standards.

The old municipal power providers will share ownership of the new REDs in the same proportions as their prior participation in the distribution of power within their respective districts. For the time being, NamPower will hold an average of 28 % ownership of all five new companies.[12] Three of the five REDs have already gone into business (NORED in 2002, Erongo RED and CENORED in 2005). In the regions belonging to the two remaining REDs (Southern RED and Central RED) in the southern part of the country, amalgamation of the municipal providers into regional companies is well under way.

Other Actors

Electricity Control Board (ECB)

The Namibian regulatory authority was established in accordance with the provisions of the Electricity Act (Act 2 of 2000) for the purpose of regulating the electricity sector enterprises (licensees) and ensuring that the electricity market develops in a manner to reflect the interests of all concerned.

The ECB is responsible for issuing the prescribed licenses to all actors engaged in the generation, transmission, distribution, sale and importing/exporting of electricity in Namibia. The requisite awarding procedures were established within the ECB and are being successfully applied. To date, NamPower and the five REDs are still the most important licensees following restructuring of the electricity sector.

10 Until 1993 the company's name was South West African Water and Electricity Corporation (SWAWEC). Originally, SWAWEC was a full subsidiary of the Industrial Development Corporation of South Africa.

11 Presumably, NamPower will relinquish these direct customers to the still-to-be-established REDs sometime within the next two years in order to withdraw completely from the power distribution sector.

12 No information is available regarding further holdings.

The ECB's independence is limited by the fact that the Ministry of Mines and Energy is responsible for finalising the granting of all licenses. The ECB merely makes recommendations after having examined and evaluated the incoming license applications. The further fact that the ministry has in several cases disagreed with the ECB experts' recommendations[13] leaves room for conjecture that the views of the ministry and the ECB are liable to diverge on issues regarding developments in the electricity sector.

The ECB is headed by a five-member board of directors appointed to four-year terms by the Minister of Mines and Energy. The technical secretariat attends to routine duties assigned to the ECB in pursuance of its statutes. This includes issuing licenses, approving tariffs, ensuring the quality of supply, settling disputes and helping restructure the Namibian energy sector.

14.3 Legal Framework

Fundamental statutory regulations

In 1998 the Ministry of Mines and Energy issued a White Paper on Energy Policy that defined the boundary conditions for the future development of the electricity sector. A study[14] conducted on the basis of that paper and published in 2000 now serves as the foundation for the administrative Electricity Act (Act 2 of 2000) which likewise was adopted in 2000. Restructuring of the electricity sector is also based on that same 1998 White Paper, which therefore also still serves as the foundation for Namibia's energy policy.

The Ministry of Mines and Energy is also responsible for establishing the outline policy stipulations that provide a working basis for the ECB's activities. The ministry exercises power of decision over recommendations made by the ECB.

Restructuring of the electricity sector

In the year 2000 the national power utility NamPower began to restructure its business operations, a process that will be concluded with the establishment of the two remaining REDs in the southern part of the country in 2007. Now, the once vertically integrated enterprise comprises three clearly delimited core areas: power production, power transmission and power trading.

Power trading remains an independent division of the public enterprise and is closely interlinked with the power transmission business area. As such, NamPower has the function of a single buyer for the Namibian electricity market.

Exactly what a single buyer for the Namibian electricity sector is supposed to do, however, is still a matter of dispute between the Ministry of Mines and Energy and the ECB. The latter regards the single-buyer model as a transition towards a further liberalised electricity market in which producers and providers can conclude contracts of supply directly with one another.

NamPower, however, believes that the single-buyer model is unsuitable for the Namibian electricity market. How that market actually does develop in the future is a matter that remains to be seen. Presently, the close linkage between power trading and NamPower's other two divisions (production and transmission) makes this state-owned enterprise the dominant player on the electricity market.

When the restructuring has been concluded, NamPower will no longer be a power provider. The plants and customers will pass to the new regional electricity distributors (REDs).

As things stand, there are no present plans either for splitting off any further NamPower parts or divisions into independent enterprises or for privatising the company.

13 For example, the licenses that the ministry has issued to some REDs have longer terms than those recommended by the ECB.
14 Study of the Restructuring of the Namibian Electricity Supply Industry (ESI) (2000).

Opportunities for independent power producers

In more than one policy statement, the Ministry of Mines and Energy has come out openly in favour of an unfettered, market-oriented, transparent electricity market offering an attractive environment for private investment. Thanks to the licensing model that is being implemented by the ECB, independent actors enjoy open access to the Namibian electricity market. Independent power producers are able to inject their outputs into the NamPower-operated power grid. However, the public utility is providing just as little concrete information about the associated transmission fees as it is about remuneration for purchased power.

There are no political or legal barriers to prevent participation in the Namibian electricity market. The absence of a genuinely independent single buyer, however, makes it difficult for independent power producers to calculate their chances of making a profit. Potential providers are still too dependent both on which electricity prices NamPower deems appropriate and on which conditions NamPower attaches to the purchase of electricity. Since NamPower operates power plants, too, the company could fall into a conflict of interest as a power trader, since it would be only natural for the company to keep the profitable utilisation of its own generating capacities first in mind.

14.4 Policy Promoting Renewable Energy Sources

Promotion programmes

The outline stipulations on policy for the promotion of renewable energy sources are contained in the aforementioned 1998 White Paper on Energy Policy. This deals with the planning and institutional promotion of the utilisation of renewable energy sources and the rational use of energy, albeit without mention of any concrete implementing regulations.

In 2001, within the scope of a project entitled Namibia Renewable Energy Programme and with assistance provided by UNEP, the government planned and developed a national framework programme for the promotion of renewable energies. The programme is supposed to incorporate the objectives of the government as well as the measures that need to be implemented in order to achieve those objectives. However, the government has yet to adopt a corresponding programme.

In July 2006, NamPower set up a new subdivision concerned with the promotion of renewable energies. The new subdivision is tasked with developing strategies for cooperation with producers of renewable energy within the scope of joint ventures, but also has the role of concluding power purchase agreements with such producers. Developers and investors involved in projects based on renewable energies are invited to present their plans there.

With a view to promoting the use of renewable energies, particularly in rural areas, the Ministry of Mines and Energy began in 1996 to allocate money for what it called a Solar Revolving Fund, by way of which solar home systems[15] can be financed. The loans are repayable over five years at an interest rate of 5 %. Since 2005 the revolving fund has been administered by the Windhoek-based company Konga Investment (Pty) Ltd.

International promotion measures

The Namibian government launched its UNDP/GEF-assisted Barrier Removal to Namibian Renewable Energy Programme (NAMREP) in 2004. The programme pursues two main objectives: to improve, with the aid of photovoltaic systems, access to electricity in rural areas without connection to the national power grid, and to help conserve fossil sources of energy while reducing Namibia's dependence on imported energy by expanding the use of solar thermal water heating systems. The project consists of two phases. Phase 1, which was very largely completed in 2006, was devoted to eliminating organisational and technical barriers to the dissemination of solar technologies.

15 Since 2005 it has also been possible to finance solar-thermal hot water heating systems via this fund.

The main barrier was a lack of both technical expertise and market opportunities for solar technology. That satisfied the prerequisites for the second phase, the purpose of which is to accelerate the dissemination of solar technologies by better accommodating the available equipment and financing options to the actual needs of potential users.

Several different components are intended to help make the NAMREP programme successful: training and upgrading; elimination of institutional, financial and technical barriers; promotion of public awareness and social acceptance; and development of demonstration and pilot facilities. The programme was promoted with US$ 2.7 million in its first phase, and US$ 2.6 million is earmarked for the second phase.

The Danish development assistance organisation DANIDA is also cooperating with Namibia within the scope of a bilateral Special Environmental Assistance programme, the goals of which include the sustainable production and use of energy. In 2004, DANIDA launched its three-year Namibian Renewable Energy and Energy Efficiency Capacity Building Project (REECAP), which has a volume of some 1.1 million euros and is geared to informing the urban and rural populations about the opportunities offered by renewable energies while raising their awareness in connection with the rational use of energy.

Clean Development Mechanism

Namibia ratified the Kyoto Protocol on 4 September 2003, although as yet no designated national authority (DNA) has been set up. Consequently, for the time being no CDM projects can be implemented in Namibia, nor have any plans been laid for CDM projects involving renewable energies.

14.5 Status of Renewable Energy Sources

The huge Ruacana hydroelectric power station is the main component of Namibia's national power generating capacity. The exploitation of existing wind, solar and biomass potentials for the domestic generation of electricity is still marginal.

Hydropower

Namibia obtains most of its electricity from the 249 MW Ruacana hydropower plant on the Kunene River, which forms the border to Angola. In view of dwindling power supply capacity reserves, the government commissioned a "hydropower master plan" within the scope of a detailed study designed to yield insight into the country's existing hydropower potential. The plan lists twelve possible sites for additional hydropower plants. Counted together, the sites in question could yield a maximum annual output of 6,932 GWh, some 5,500 GWh of which could, according to the cost structure laid out in the master plan, be produced for less than 0.027 euro/kWh.

Name of project	Rating [MW]	Output [GWh]
Ondurusu	58	225
Zebra	30	115
Epupa	340	1,724
Baynes	225	1,120
Marien	230	1,170
Hartman	125	630
Hombolo	170	855
Mcha	80	410
Divundu A	19	150
Onseep B	29	151
Vioolsdrift	44	227
Aussenkehr	30	155

Tab. 7: Hydropower potentials in MW and GWh; Namibia[16]

16 Source: Ministry of Mines and Energy – Directorate of Energy.

NamPower has conducted in-depth studies and drawn up plans for two such large-scale projects (Epupa and Baynes). However, since it was decided in 2006 to implement the Kudu natural gas project, NamPower is no longer pursuing any major hydropower projects. Even the small Popa Falls run-of-river project (Divundu A, 19 MW) envisaged for the Okavango River in the northeast corner of the country is not being implemented by NamPower for the time being. Technical studies and an environmental report providing for construction of a 9.75 m-high weir already exist for Popa Falls. Construction would take about three years and cost approximately 33 million euros. According to NamPower, the project could be implemented by an independent power producer if sufficient international funding and/or private investment capital were to be made available.

Wind energy

Wind potential

The wind conditions prevailing in Namibia were investigated within the scope of a GTZ promotion programme entitled Promotion of the Use of Renewable Energy Sources in Namibia, which was launched in 1993.

Then, in a 1996 study commissioned by GTZ and executed in cooperation with the national power utility NamPower, detailed wind measurements were performed at two promising locations on the Namibian Atlantic coast (Walvis Bay and Lüderitz). The purpose of the studies was to clarify whether or not the selected sites would be suitable for hosting wind farms. Meteorological and technical aspects as well as economic considerations and infrastructural matters were all given due consideration.

Site	Annual average wind speed [m/s]	Energy density [kWh/m²a]	Weibull parameters, A,k
Walvis Bay "Saltworks"	6.8	3,047	A=7.73 k=2.17
Lüderitz "Golf Course"	7.5	4,936	A=8.4 k=1.70

Tab. 8: Wind potential at height of 50 meters for two sites in Namibia[17]

The Namibian wind regime is dealt with in one chapter of the InWEnt publication Wind Regimes of Africa[18], where the measured data from both site studies are evaluated. The results show that Namibia has some excellent wind potentials at sites situated along its Atlantic coast.

Wind power plants

The first wind energy conversion system installed in Namibia was a now twelve-year-old, second-hand 220-kW turbine which, with technical assistance rendered by the Danish development assistance organisation DANIDA, was erected in late 2005 eleven kilometres east of Walvis Bay, i.e. in the desert. Its output is fed into the power grid operated by the regional provider ErongoRED.

Planned wind farms

Judging on the basis of the obtained measured data, the site studies and an environmental report, the national power utility NamPower decided in favour of constructing a wind farm near Lüderitz. Within the scope of a pilot project, a plant was planned with an initial rating of 3 MW and an eventual full rating of 20 MW. In December 2001, however, the Namibian Electricity Control Board refused, on economic grounds, to issue the requisite license for the project. In March 2003, the Namibian government appointed a project development team to help them define clear-cut directives regarding the production of wind-generated electricity.

17 Source: Ministry of Mines and Energy – Directorate of Energy.

18 Jargstorf, Benjamin, Wind Regimes of Africa – Comparative Evaluation of Wind Data from Selected Countries, InWEnt Division Environment, Energy and Water, Berlin, 2004.

The team is also tasked with spurring on the wind farm construction project in Lüderitz. If and when that plant is ever actually commissioned is another matter that remains to be seen.

It became known in early 2007 that a Danish investor is planning wind parks with a total output of 92 MW. Seventy turbines are supposed to be installed around Big Bay outside Lüderitz, and 16 each near Oranjemund and at Walvis Bay. The total investment is put at towards 100 million euros, and the Danish Government, among other donors, is expected to contribute some of the funds. An application for a power generating license has already been submitted to the ECB. Power generation is expected to cost 2.6 euro cents/kWh (N$ 0.24/kWh), and the operator is expecting NamPower to pay 3.8 euro cents/kWh (N$ 0.35/kWh). The first turbines are supposed to be installed in October 2007, and the full capacity is expected to come on-line by 2009.

Biomass

According to information provided by the Namibian Ministry of Mines and Energy, some 80 % of the rural population use biomass as their principal source of energy – almost exclusively in the form of firewood for cooking and heating. Countrywide, between 15 % and 20 % of all primary energy consumed comes from wood. A national steering committee[19] established in 1998 is drawing up plans for the sustainable utilisation of existing biomass resources.

Biogas

The National Biogas Programme launched in June of 2000 is being jointly administrated by the Ministry of Mines and Energy and the Ministry of Agriculture. With the aid of technical assistance rendered by the Government of India, ten small biogas digesters (3-5 m^3) have been installed in Namibia as part of a model project. However, the systems are not producing any electricity at the moment.

Solar energy

In large parts of Namibia the daily insolation rate exceeds 6 kWh/m^2. Even in the less sunny coastal regions, rates of the order of 5.5 kWh/m^2d can be expected. Thanks to the fact that nearly the whole country enjoys more than 300 sunny days a year, the average daily sunshine duration ranges between nine and ten hours. This gives Namibia excellent meteorological prerequisites for the utilisation of solar energy.

In connection with the aforementioned NAMREP programme, the Government of Namibia has taken measures to improve the conditions for harnessing solar energy within the country. Efforts are focussed on three technologies: solar home systems (SHS), photovoltaic water pumps for wells, and solar thermal water heaters. Market analyses, application scenarios, feasibility studies and technical guidelines have been developed for all three principal applications of solar energy within the scope of the NAMREP programme.

Photovoltaics

In the course of the government's “Home Power!” programme, which expired in 2003, some 600 to 700 rural households with no access to the public power grid received small solar systems. Such systems are still being financed via small, low-interest loans from the aforementioned Solar Revolving Fund. According to information from the Ministry of Mines and Energy, more than 1000 solar home systems had been installed in Namibia by July of 2006. An on-grid photovoltaic plant with a rating of 5 kW_P was installed at the Habitat Research and Development Centre of Namibia in 2004. It is now feeding electricity into the grid operated by the local power provider. No information is available on remuneration or feed-in terms.

19 National Steering Committee on the National Biomass Energy Conservation Programme under the direction of the Ministry of Mines and Energy.

Solar thermal systems

In 2005 there were approximately 3,200 solar thermal water heating systems installed in Namibia, two-thirds of which, some 2,100 systems, were in use in private households. Hence, about 2.3 % of all Namibian households with any kind of hot-water system had solar thermal equipment. The remaining one-third of the systems were serving either commercial/industrial buildings or public facilities. Between 2000 and 2005 the sale of solar thermal systems increased at an annual average rate of 16 %. Now, some 200 new systems are being installed each year.

The domestic market, however, is still too small to sustain domestic production. Five different companies import solar thermal equipment from abroad, and six contractors have specialised in the installation of such systems. The main impediment to the further dissemination of solar thermal systems is a combination of low electricity rates and the high initial cost of the equipment. Since 2005, though, not only photovoltaic systems but also solar thermal systems can be financed via the Solar Revolving Fund that the Ministry of Mines and Energy set up to help promote renewable energies.

14.6 Rural Electrification

Degree of electrification

Just under 1.5 million people, or 72 % of the Namibian population, live in rural areas. Of the 2,855 villages to be found in Namibia, roughly 2,400 still have no link to the national power grid. One hundred and thirty-one villages are situated in officially declared off-grid areas, but the Ministry of Mines and Energy plans to get the remainder connected to the grid within the next 20 years. Since Namibia gained independence from South Africa in 1990, rural electrification has added approximately 8,330 households in 400 settlements to the public power grid.

Rural electrification programme

Namibia launched a rural electrification programme in 1990. The Rural Electricity Distribution Master Plan from the year 2000 covers all future electricity customers in the country that have not yet gained access to electricity. The Master Plan includes provision for both grid-connected power and decentralised electrification with the aid of renewable energy. In the past, various different organisational approaches have been taken to rural electrification with solar energy systems. Most PV systems have been purchased by the owners themselves with funds secured via the Home Power! programme as a developmental measure of the aforementioned Solar Revolving Fund.

A fee-for-service model was tested in the village of Ovitoto in 2002. There, some 100 households were equipped with solar systems, and only the electricity actually consumed was paid for, according to a prepayment system. In such a thinly populated area of Namibia, however, system maintenance and accounting proved uneconomical. Consequently, the systems were transformed into "normal" solar home systems in 2004, and the users now pay a monthly fixed rate until the respective system is paid for in full and they assume ownership.

Isolated grids

In addition to individual solar home systems, Namibia also has a number of off-grid regions that are suitable for electrification in the form of small isolated solar networks.[20] Combinations with other sources of electricity, such as wind power or diesel generators, present themselves as a supplementary alternative. In 2004, the Gobabeb Desert Research Station in Namib Naukluft Park commissioned a PV-diesel hybrid facility with a rating of 26 kW_P to serve a small network of 25 consumers.

Exchange rate (15 February 2007):
1 Namibian dollar (NAD) = 0.10799 euro (EUR)
1 EUR = 9.25983 NAD

20 See also: Ministry Of Mines And Energy – Directorate of Energy, Baseline Study: Barrier Removal To Namibian Renewable Energy Programme (NAMREP) Final Report, Namibia, 2005, page 50.

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There is great potential for generating electricity from renewable energy sources in many developing and emerging countries. Obstacles to the exploitation of such sources and to the involvement of foreign investors include a lack of knowledge of framework conditions in the energy industry and insufficient transparency with regard to the prior experience and interests of national actors. This fourth, updated and expanded edition is aimed at overcoming barriers such as these.

The electricity markets and their respective actors are investigated for 23 countries in various regions: Latin America, Africa – Middle East and Asia. The country studies 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.

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