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 Senegal

Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH

commissioned by:

Federal Ministry
for Economic Cooperation
and Development

# Energy-policy Framework Conditions for Electricity Markets and Renewable Energies

## 21 Country Analyses

**Eschborn, June 2004**

**Published by:**
Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH
Division Environment and Infrastructure
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

**Design:**
Open Ffm., www.open-agentur.de
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.

Eschborn, June 2004

**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.



# 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

# Contents

# Senegal

## Electricity Market

### Capacities

Electricity supply in Senegal is based primarily on production in thermal power stations. In 2002 the total installed capacity in Senegal amounted to 380 MW. Of this, 138 MW was accounted for by steam power stations, 99 MW by diesel generating stations and 92 MW by gas-turbine power plants. A private American company (GTI) operates a combined-cycle power plant rated at 51 MW. All of the oil required for power generation is imported.[148] A proportion of the capacity of the Manantali hydroelectric power station in Mali, amounting to 60 MW, is available to Senegal, making the total available capacity in Senegal approximately 440 MW.

### Electricity generation and imports of electricity

Electricity production within the interconnected grid run by the monopoly power utility Société Nationale d'Electricité (SENELEC) reached about 1,652 GWh in 2002. Since July 2002 Senegal has been importing a third of the electricity that is produced in the Manantali hydroelectric power station (200 MW capacity) in Mali. The power station is managed by the Manantali Water Management Company (SOGEM).

Time and again over the past years, the power industry in Senegal has been unable to satisfy the demand for electricity in the country. Firstly the existing capacity is insufficient to meet this demand, which is continuing to grow, while secondly many of the power stations are obsolescent, and consequently have to be shut down at frequent intervals in order to allow essential repairs to be carried out.

### Power transmission

The interconnected grid (225 kV) operated by SENELEC is concentrated in the west of Senegal. As well as this there is a new link for purchased power from the above-mentioned hydroelectric power station in Mali. The majority of Senegal is not connected to the public power grid.

### Electricity consumption

Electricity consumption in Senegal has risen at an average of 6% per annum over the past 10 years. The projected annual rate of growth for the next 10 years is even higher, namely an average of 10%.

In 2001, electricity sales totalled 1,295 GWh. 90% of all electricity consumption was concentrated in the west of Senegal, or the regions of Dakar, Kaolack and Saint-Louis. The difference with respect to electricity production is explained by high transmission losses (caused by a dilapidated network infrastructure) and from the illegal consumption of electricity without payment.

| | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|
| **Production** | **1,304** | **1,348** | **1,476** | **1,652** |
| **Sale** | **1,074** | **1,063** | **1,149** | **1,295** |
| - High voltage | 163 | 165 | 185 | 202 |
| - Medium voltage | 384 | 384 | 389 | 418 |
| - Low voltage | 528 | 514 | 575 | 675 |

**Table 29: Electricity production and consumption in the interconnected grid; Senegal; 1998–2001; GWh[149]**

### Generating costs and electricity prices

In 2002 the average electricity generating costs in SENELEC power stations were 5.8 € cents/kWh. There are however wide differences between the individual power stations: the costs vary between 3.8 € cents/kWh (modern diesel generating station) and 9.8 € cents/kWh (old steam power station). In contrast, the production costs for electricity from the Manantali hydroelectric power station amounted to only 2.6 € cents/kWh.

The average electricity purchase costs for Senegalese end consumers were 11.3 € cents/kWh in 2001. Compared with 1992, electricity prices had risen by roughly 30%, which corresponds to an average annual increase of 3.4% per year.

| | 1998 | 1999 | 2000 | 2001 |
|---|---|---|---|---|
| CFA francs | 72.27 | 73.75 | 74.10 | 73.30 |
| €-cents | 11.12 | 11.35 | 11.40 | 11.28 |

**Table 30: Average electricity prices for end consumers[150]**

148 Senegal does however have its own oil resources (offshore), which are estimated at 700 million barrels. Extraction is supposed to begin in the next few years. Senegal also possesses deposits of natural gas (32.3 billion $m^3$); these are already being used in electricity production.

149 Source: SENELEC, Annual Report.

150 Source: SENELEC, Annual Report.

## Market Actors

SENELEC produces most of the electricity in Senegal. Following two failed attempts at privatisation, the enterprise is presently back in state ownership.[151] Another targeted date for privatisation has been set for the end of 2004/2005.

The American company GTI has been operating a combined-cycle power plant with a capacity of 50 MW at Cap de Biches since 1999. It is the first power station operated by an independent power producer in Senegal. The term of the operator agreement with SENELEC extends for 15 years.

Three large private industrial enterprises – the chemicals company Industries Chimiques du Sénégal (ICS), the sugar producer Compagnie Sucrière du Sénégal (CSS) and the agro-industrial firm (peanut processing) Société Nationale de Commercialisation des Oléagineux du Sénégal (SONACOS) – operate their own electricity generating facilities with a total capacity of 90 MW, most of which is used for their own requirements.[152]

### Solar energy companies

About 20 small companies and non-governmental organisations market solar home systems (SHSs), low-powered photovoltaic systems designed to supply electricity to individual households. Most of these companies have joined forces in the Fédération des organisations pour la Promotion des Energies Renouvelables (FOPEN). In addition to its role as a trade association and coordination mechanism for the solar energy sector, FOPEN also offers energy consultancy services and takes care of the installation and maintenance of SHSs.[153]

### Other market actors in the renewable energy field

Other important market participants in the field of renewable energy sources are the consultancy company SEMIS,[154] the solar enterprise Total Energie Afrique de l'Ouest (TEAO), Matforce, Equip Plus, Buhan & Teisseire, Secom Afrique, Synergies and S.3.A,[155] along with the Senegalese company AME Solar, which sells, installs and maintains solar collectors.[156] EIC, a company from Saint-Louis, produces wind-power-operated water pumps for the local market.

The Société Africaine des Energies Renouvelables (SAER) is active in the fields of both wind and solar energy. SAER works mainly for the Senegalese Renewable Energies Association ASERA, but in the past it has also participated in various projects funded by bilateral and multilateral donors (World Bank, UNDP, the Netherlands).

## Legal Framework

### Reform of the electricity sector

The Senegalese Government began reforming the electricity sector and opening it for private investors in 1998. Two laws in that year (98–29[157] and 98–06) created a state regulatory authority for the electricity sector (Commission de Régulation du Secteur de l'Electricité, CRSE) and converted the state-owned SENELEC into a joint-stock company.

At the same time the electricity production sector was opened up for private investors and operators (IPPs).[158] In its strategy paper on the development of the energy sector, the Senegalese Government declared that preference should be given to new power plants being built by private companies. The reason for this is above all SENELEC's chronic shortage of capital.

---

151 SENELEC currently has almost 400,000 customers. As the company has been a chronically loss-making operation for many years now, the government had to increase the equity capital several times between 2000 and 2001 in order to be able to make the necessary investments in the electricity sector.

152 In 2002 these companies sold only 73 GWh of electricity to SENELEC compared with 311 GWh in 2001.

153 Other trade associations and non-governmental organisations in the field of photovoltaics are the Association Sénégalaise des Energies Renouvelables et Alternatives (ASERA) and the Association Sénégalaise d'Energie Solaire (ASES).

154 Services de l'Energie en Milieu Sahélien (SEMIS), founded in 1987, compiles studies and expert reports on the subjects of hydropower, electrification, traditional forms of energy and irrigation.

155 The addresses of the above-named companies are listed at http://www.areed.org/country/senegal/contacts.pdf.

156 AME Solar is planning to set up production facilities for solar collectors in the coming years. The company is receiving financial assistance in the form of a loan from the African Rural Energy Enterprise Development Program (AREED) amounting to US$ 41,000.

157 Loi d'orientation relative au secteur de l'électricité (skeleton law for the electricity sector).

158 To this end, the IPPs enter into build-own-operate (BOO) agreements with SENELEC. The details are governed by a series of decrees: Décret n° 98-334 fixant les conditions et modalités de délivrance et de retrait de licence ou de concession de production, de distribution et de vente d'énergie électrique; Décret n° 98-335 relatif aux principes et procédures de détermination et de révision des conditions tarifaires; Décret n° 98-336 relatif aux prises de participation entre entreprises du secteur de l'électricité.

### SENELEC's tasks

However, even in the next few years, until the electricity sector is fully liberalised, SENELEC will retain its monopoly over the purchase (as a single buyer) and distribution of electricity. SENELEC also has sole responsibility for the transmission of electricity at the high-voltage level.

### Areas of responsibility

The Energy Directorate within the Ministry of Mining, Energy and Hydropower (Ministère des Mines, de l'Energie et de l'Hydraulique) is responsible for elaborating Senegalese energy policy. Until privatisation is complete, the Ministry holds the authority to issue instructions to SENELEC.

CRSE is responsible for among other things the granting of licences and concessions[159] (and for monitoring these), establishing competition on the electricity market, setting electricity tariffs for all end customers, and providing advice on planned new legislation.

The state-owned Senegalese Agency for Rural Electrification (Agence Sénégalaise d'Electrification Rurale, ASER) is responsible for electricity transmission and distribution in the rural regions only.

### Energy policy strategy paper of April 2003

The strategy paper on development of the energy sector (Lettre de Politique de Développement du Secteur de l'Energie) of 9 April 2003 identifies the problems of the Senegalese energy sector (i.e. above all the shortfall in electricity generating capacities and the lack of electrification for the majority of the population) and lays down the energy policy framework for the coming years. This framework includes in particular the provision of modern forms of energy as a tool in the fight against poverty (especially within the context of rural electrification) and the restructuring of the energy sector (in connection with a greater role for the private sector).

### Clean Development Mechanism

The Senegalese Government adopted the Kyoto Protocol in January 2001, although it has yet to finally ratify it.

## Policy for Promoting Electricity Generation from Renewable Energy Sources

The paramount objective of today's Senegalese energy policy is to ensure secure provision of sufficient energy to the population. At present the government's efforts are concentrated on expansion of the national power station inventory, preferably with the involvement of independent power producers, and on rural electrification. In this context the government is mostly placing its faith in conventional thermal plants. Renewable energy sources are only given consideration in relation to the electrification of rural areas of Senegal.

There are no direct financial assistance measures on the part of the Senegalese Government aimed at promoting the use of renewable energy. That said, imports of components for photovoltaic systems and of solar collectors are exempted from customs duties and from value-added tax. Furthermore, as long ago as 1981 a law was passed that allows an exemption from tax amounting to 30% of the investment costs for solar and wind energy systems.[160] Within the framework of various GTZ projects, investigations are currently in progress to examine how the government can be assisted in the creation of appropriate general conditions for producing electricity from renewable forms of energy.

## Status of Renewable Energy Sources

### Hydropower

Although Senegal possesses an estimated hydropower potential of 700 MW, to date not a single hydroelectric power plant has been built. Since July 2002, however, 60 MW of output has been available to the national electricity market from the Manantali hydroelectric power station on the Senegal River in Mali (equivalent to one third of the total electricity production from the power station). Senegal, together with Mali and Mauritania, participates in the management of the Manantali dam and power station through the organisation of the riparian states utilising the Senegal River (Organisation de la Mise en Valeur du Fleuve Senegal, OMVS).

159 Licences for electricity production and concessions for the electrification of rural areas are subject to a public tendering process.
160 Loi 81-22 du 25 juin 1981 instituant des avantages fiscaux pour investissements dans le domaine de l'utilisation de l'énergie solaire ou éolienne.

## Wind Energy

Senegal's wind power potential is concentrated along the coast, and in particular the section of coast between Dakar and Saint- Louis. In a study carried out by the Senegal Meteorological Service, wind velocities of 3.7–6.1 m/s were observed in the 50km-long coastal strip between Dakar and St. Louis. In inland areas wind velocities of 2 to 3 m/s are the norm, and are therefore of no interest for exploitation for energy generation. No comprehensive scientific survey of wind data has taken place to date.

### Traditional use of wind power

At present, wind power is primarily utilised in Senegal in the form of small installations for operating water pumps. There are estimated to be 200 serviceable wind-powered water pumps installed at the moment. The Senegalese-Mauritanian non-governmental organisation Alizés promotes the installation of wind pumps, and receives assistance from the European Union and French development cooperation to do so.

### Electricity generation

So far no grid-coupled wind power plants have been installed. The Canadian consultancy company Helimax drew up a study on behalf of the Canadian Foreign Ministry in 2002 in which it investigated the possibility of building a wind farm with a capacity of 50 MW. This project is not currently being pursued further, however.

Instead, the Senegalese Ministry of Mining, Energy and Hydropower would like to locate a wind farm with an output of at least 10 MW in the coastal region between Dakar and Saint Louis. It is intended that the generated electricity should be fed into the interconnected grid.

### GTZ support with wind measurements

In this connection, an appraisal mission conducted as part of the GTZ TERNA programme at the end of 2003 came to the conclusion that electricity generation from wind energy can be undertaken economically in Senegal as of wind velocities of 5.3 to 6.3 m/s (depending on the provision of low-interest loans or of an investment subsidy). The GTZ will possibly carry out wind measurements at two to three locations in order to obtain reliable data for potential wind projects.

## Biomasse

More than 50% of Senegal's energy provision is based on the traditional utilisation of biomass in the form of fire-wood or charcoal. The country has reserves of peat that are estimated to amount to 52 million m$^2$; this could be used as a substitute for wood and hence call a halt to the advancing destruction of Senegalese forests.[161] The potential for using peat or also industrial, agricultural or municipal wastes to generate electricity or produce heat has so far been insufficiently researched.

Two companies involved in agri-industry, Compagnie Sucrière du Sénégal (CSS) and Société Nationale de Commercialisation des Oléagineux du Sénégal (SONACOS), currently generate about 40 MW of electricity from organic residues from sugar production and peanut production respectively, primarily for their own power needs.

In addition to the industrial use of biomass there are also a few small biogas plants for supplying energy to households. These were developed by Enda-TM and the Agricultural Research Centre (CNRA).

## Solar Energy

Senegal has very considerable potential for solar energy. Average daily solar irradiation is of the order of 5 kWh/m$^2$. Around this figure, the solar energy potential varies between the sunnier north (5.8 kWh/m$^2$ in Dakar) and the less sunny south (4.3 kWh/m$^2$ in Ziguinchor).

Solar energy is mainly exploited in Senegal with the aid of small-scale photovoltaic systems, solar home systems (SHSs). The output of all PV systems installed at present is estimated to be approximately 1 MW$_p$. Solar home systems are playing an ever greater part within the government's rural electrification programme.

## Geothermal Energy

According to data from the International Geothermal Association, no use is made of geothermal energy in Senegal either directly or for electricity generation. No information is available about the country's geothermal potential.

161 It is estimated that 80,000 hectares of forest are destroyed in Senegal every year.

## Rural Electrification

Despite the investment of CFAF 20 billion (some € 30 million) in rural electrification between 1995 and 2002, only 268 of the 13,000 villages (settlements with a population of below 1,000) have an electricity supply. The overall electrification rate in the rural regions of Senegal is presently no higher than 8%.

### Electrification programme up until 2015

The Senegalese Government is aiming to achieve a rural electrification quota of 15% by 2006. In the second phase of the rural electrification programme (2007 to 2015) the target is to reach 30%. A budget equivalent to € 259 million is earmarked for rural electrification for the period from 2003 to 2007 alone. In the coming years a greater emphasis is to be placed on the involvement of the private sector.

### Senegalese Agency for Rural Electrification – ASER

The Senegalese Agency for Rural Electrification (Agence Sénégalaise d'Electrification Rurale, ASER), which was founded in 2000, is responsible for the supply of electricity to rural areas of Senegal. The rural regions of Senegal as a whole have been divided into a total of 18 licence areas.[162] The electrification of these areas is put out to public tender by ASER and is undertaken by private-sector enterprises. ASER merely takes over the financing and provides technical and advisory support.

The process of rural electrification by ASER also receives financial assistance from various international donors in addition to the Senegalese Government. The donors include the GTZ, the Kreditanstalt für Wiederaufbau (KfW), the World Bank, the African Development Bank (AfDB) and the Islamic Development Bank.[163]

### Contribution of renewable energy sources

Renewable forms of energy are also increasingly being used for the electrification of peripheral rural areas. ASER assumes that photovoltaic systems will account for 20% of the total budget for rural electrification in the coming years. A study produced by the Japan International Cooperation Agency (JICA) estimates total demand at 83,000 SHSs within the framework of the rural electrification programme.

### Supply of solar home systems

Initial supply contracts for SHSs were agreed between ASER and international companies in the solar energy industry over the past two years. In August 2002 the Spanish company Atersa, a subsidiary of the American firm AstroPower Inc., was commissioned to install PV systems for 227 villages. Within the scope of this project a total of 425 $kW_p$ will be installed to supply electricity to schools, health centres and other public facilities. The total financial volume of the project amounts to € 7.5 million.

Since the 1980s the installation of SHSs in Senegal has been promoted as part of rural electrification projects by foreign donors, above all from Japan, Germany, France, Italy and Spain. A relatively large project by the GTZ, the Senegalese Government and the non-governmental organisation Enda-TM, for example, enabled the installation of a total of 2,300 SHSs in the 1990s. The project also played a part in the founding of the trade association FOPEN.

### GTZ PERACOD programme

In the next few years the GTZ will provide additional support for the installation of electricity supplies in rural regions of Senegal as part of a new project on 'Promotion of Rural Electrification and the Sustainable Provision of Domestic Fuels' (Promotion de l'Electrification Rurale et de l'Approvisionnement Durable en Combustibles Domestiques – PERACOD). Within this, the focus will be partly placed on the provision of advisory services on general legal conditions and national strategies for renewable energies and on support for ASER with the organisation and implementation of its rural electrification programme. These measures will further strengthen the energy-policy capacities already available to the Senegalese Government and thus create a basis for the broader dissemination of renewable energies in Senegal.

Exchange rate: 1,000 CFA francs = € 1.52
(the CFA franc is linked to the euro at a fixed rate)

162 SENELEC is responsible for the electrification of all other areas, i.e. primarily the towns and cities.
163 KfW is financing the electrification of the regions of Fatick, Gossas, Kaolack and Nioro.

## Information Sources


- Ambassade de France au Senegal: L'Electricité au Senegal; Octobre 2001
- African Rural Energy Enterprise Development (AREED): Country Report Senegal; 2000
- Carnevale, Bruce: Senegal's new rural electrification project will include PV; in: PHOTON International; January 2003
- Dabo, Bacary: Electrification rurale au Sénégal: la Banque mondiale visite l'expérience des Îles du Saloum; in: Sud Quotidien; 30 Septembre 2003
- Fall, Alioune: Integration of Social and Environmental Concerns into Power Sector Reform: Senegal's Experience; in: Power Sector Reform and Sustainable Development. Brainstorming Meeting. IEA Headquarters, Paris, France; 21–22 May 2002
- Fall, Alioune: Les partenariats publics privés en matière de développement énergétique. Le cas du Sénégal; in: Table Ronde Préparatoire n°1 pour le Symposium sur l'accès aux financements internationaux; 18–19 Septembre 2003
- Krampitz, Iris: Atersa to supply PV systems for 227 villages in Senegal; in: PHOTON International; September 2002
- Kumasi Institute of Technology and Environment (KITE): Status of Renewable Energy and Energy Efficiency Systems in West Africa; June 2003
- Lund, John: Status Geothermischer Energie im Jahr 2000; in: Geothermische Energie; March 2000
- Owsianowski, Rolf: The Senegalese Organisation ASER; VPaper at the 2nd European PV-Hybrid and Mini-Grid Conference; September 2003
- Platts: Country Profile Senegal; October 2003
- République du Sénégal: Etude de Faisabilité d'une Valorisation des Residus Agricoles et Agro-Industriels comme Combustibles Domestiques au Sénégal; Septembre 1998
- République du Sénégal, GTZ: Du Charbon bio à partir des Coques d'Arachide au Sénégal. Déscription succinte du projet; March 2001
- République du Sénégal: Lettre de Politique de Développement du Secteur de l'Energie; April 2003
- Republic of Senegal, UNEP: Economics of Greenhouse Gas Limitations. Country Studies Series; 2001
- Sarr, Sècou: Dissemination of family photovoltaic systems in rural Senegal; in: Njeri Wamukonya (Hrsg.): Experience with PV systems in Africa. Summaries of selected cases; 2001
- Société Africaine des Energies Renouvelables (SAER): Company Profile
- Société Nationale d'Electricité (SENELEC): Rapport Annuel. Mouvements d'Energie. Année 2002; 2003
- United Nations Development Programme (UNDP): Charging up: Senegal; in: UNDP: Sharing Innovative Experience; July 2003
- US Department of Energy, Energy Information Administration: Country Analysis Brief Economic Community of West African States (ECOWAS); June 2003
- Wamukonya, Njeri: African power sector reforms: some emerging lessons; in: Energy for Sustainable Development; March 2003
- Youm, I. et al.: Renewable energy activities in Senegal: a review; in: Renewable and Sustainable Energy Reviews; March 2000

## Contact Addresses

**Ministère de l'Energie et des Mines (MEM)**
Building Administratif
B.P. 4029 Dakar
Tel. (00221) 849 70 00 / 823 87 16

**Société Nationale d'Electricité (SENELEC)**
28 Rue Vincens
B.P. 93 Dakar
Tel. (00221) 839 30 00
Fax (00221) 823 12 67
www.senelec.sn

**Commission de Régulation du Secteur de l'Electricité (CRSE)**
B.P. 11701 Dakar
Tel. (00221) 849 04 59
E-mail: crse@sentoo.sn

**Agence sénégalaise d'électrification rurale (ASER)**
B.P. 11131 Dakar
Tel. (00221) 849 47 11
Fax (00221) 849 47 20

**Association Sénégalaise des Energies Renouvelables et Alternatives (ASERA)**
Rue D x 1 Point E Pavillon Usima
B.P. 15462 Dakar
Tel. (00221) 864 26 49
Fax (00221) 824 35 42
E-mail: asera@sentoo.sn

**Centre d'Etudes et de Recherches sur les Energies Renouvelables (CERER)**
Université Cheikh Anta Diop
B.P. 476 Dakar
Tel. (00221) 32 16 92
Fax (00221) 32 10 53
E-mail: cerer@ucad.sn

**Service de l'Energie en Milieu Sahélien (SEMIS)**
B.P. 652 Dakar
Tel. (00221) 822 73 97
Fax (00221) 822 61 895
www.semis.sn

**Environnement-Développement du Tiers Monde (Enda-TM)**
B.P. 3370 Dakar
Tel. (00221) 822 24 96
Fax (00221) 821 75 95
E-mail: energy2@enda.sn
www.enda.sn

**Fédération des Organisations pour la Promotion des Energies Renouvelables (FOPEN)**
B.P. 630 Dakar
Fax (00221) 822 07 02 / 821 19 29
E-mail: rebexe@cyg.sn

**Projet Alizés**
Quartier Ndioloffène
B.P. 740 Saint-Louis
Tel. (00221) 961 49 47
Fax (00221) 961 49 46
E-mail: ohann@arc.sn
www.alizes-eole.com

**GTZ Office**
6 Passage Leblanc
B.P. 3869 Dakar
Tel. (00221) 821 61 85
Fax (00221) 822 93 15
E-mail: gtz-senegal@sn.gtz.de

**Association Sénégalaise d'Energie Solaire (ASES)**
B.P. 2027 Dakar
Tel. (00221) 827 63 13
Fax (00221) 822 97 64 / 822 45 63

**Embassy of the Republic of Senegal**
Argelanderstrasse 3
53115 Bonn
Tel. 0228 / 21 80 08
Fax 0228 / 21 78 15

**Embassy of the Federal Republic of Germany**
20, av. Pasteur
B.P. 2100 Dakar
Tel. (00221) 889 48 84
Fax (00221) 822 52 99
E-mail: reg1@daka.auswaertiges-amt.de
www.ambassade-allemagne.sn

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

One World
German Development Policy