



Energy-policy Framework Conditions for Electricity Markets and Renewable Energies

21 Country Analyses

Eschborn, June 2004

Part Jamaica



Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH

commissioned by:



Federal Ministry
for Economic Cooperation
and Development

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Published by:

Deutsche Gesellschaft für
Technische Zusammenarbeit (GTZ) GmbH
Division Environment and Infrastructure
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65726 Eschborn
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Design:

Open Ffm., www.open-agentur.de
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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 hydro-power, 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.

2. The sole authorised user of this study for all forms of use is the GTZ. Duplication or reproduction of all or part of the study (including transfer to data storage media) and distribution for non-commercial purposes is permitted, provided the GTZ and the TERNA Wind Energy Programme are named as the source. Other uses, including duplication, reproduction or distribution of all or part of the study for commercial purposes, require the prior written consent of the GTZ.

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 Jepirachi 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:

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Electricity Market

90% of Jamaica's primary energy supplies are dependent on petroleum imports. This results in an accordingly heavy burden on the national budget and the balance of trade.⁹³ Domestic renewable energy resources account for 10% of the contribution to energy supply.

Installed capacities

The capacity of the power stations feeding into the inter-connected grid, those belonging to the power utility Jamaica Public Service Co. (JPS) and independent power producers (IPPs) with a contractual commitment, presently amounts to almost 800 MW, with a peak load of 593 MW (December 2003). Power-plant units newly brought on line in 2003 increased the reserve to approximately 30%. In order to meet growing demand, according to JPS projections an additional capacity of 200 MW would have to be built in the next five years. As well as this, a capacity of around 600 MW is installed at industrial self-generators in Jamaica (in particular in the bauxite and aluminium industry), making Jamaica's total capacity approximately 1,400 MW.

Shortfalls in power supply

In recent years there have often been power failures because of the inadequate and unreliable generating plants. The shortfalls in the power supply system became particularly apparent at the time of the national collapse in October 2001. As a result of a 120 MW combined-cycle power plant being brought into service stage by stage and the associated increase in reserve capacity, power failures were reduced to a fifth in 2003 in comparison with 2001.⁹⁴

Power grid and losses

The power grid, which has 1,200 km of transmission lines and 12,000 km of distribution lines along with 53 transformer substations, currently suffers from losses of more than 18%. Of these, half are of non-technical origin and can be explained by illegal electricity tapping among the population. In the tariff structure, however, it is possible to make allowances for losses of no more than 15.8%, which means that there is an incentive for JPS to make improvements in this regard.⁹⁵

Power generation and power consumption

Net power generation by JPS plus additional power purchases from independent producers totalled 3,525 GWh in 2002, an increase of 4.9% over the preceding year.

In 2002, (paid-for) electricity consumption by the over 500,000 customers amounted to some 2,900 GWh (not including consumption by industrial self-generators). Average consumption by residential customers was very high, at 2,430 kWh. Over the coming years, average growth rates of 4,5% per annum are anticipated.

	1998	1999	2000	2001	2002
	GWh	GWh	GWh	GWh	GWh
Residential	926	1.007	1.047	1.065	1.103
Small commercial (< 25 kVA)	589	606	598	604	618
Large commercial (25 - 500 kVA)	517	521	573	583	597
Major customers (> 500 kVA)	359	383	464	474	510
Others	55	59	57	66	68
Total	2,446	2,576	2,739	2,793	2,896
Increase over previous year	7.2 %	5.3 %	6.3 %	2.0 %	3.7 %

Table 20: Electricity consumption by end customers; Jamaica; 1998-2002; GWh⁹⁶

Because of the energy-intensive bauxite-extraction and aluminium industry, the demand for energy in Jamaica is comparatively high. An indicator of inefficient energy conversion is the fact that energy intensity has risen greatly in the past 10 years. Between 1987 and 2003, gross national product grew by 20% and energy consumption by 112%.

Electricity prices

Especially because of higher oil prices and the devaluation of the Jamaica dollar, electricity prices have increased considerably in recent years. In 2003 the average revenue for JPS from the sale of electricity was approximately 8.8 J\$/kWh (11.9 € cents/kWh). The fuel costs alone (including IPP electricity purchases) made up 41% of the total costs of JPS.

93 Expenditure on imported petroleum amounted to US\$ 635 million in 2002.

94 Whereas in 2001 the length of power failure per customer was still recorded as 3,000 minutes, in 2003 this figure had fallen to about 550 minutes.

95 It is intended to reduce the losses to 16.5% by 2009.

96 Source: OUR, Annual Report 2002/2003. The electricity consumption statistics from JPS are not broken down according to commonly used consumption groups. The category of "Small commercial" corresponds to "Rate 20-General Services" in the JPS classification. The category of „Large commercial" reflects "Rate 40-Power Services". "Major customers" are customers fitting into the category of "Rate 50-Large Power". The group of "Others" comprises public lighting and self-generators who draw electricity from the public grid over and above that which they generate themselves.

Households pay a monthly standing charge of J\$ 58 (€ 0.78)⁹⁷ and a fixed basic price per kilowatt-hour of about J\$ 4.1 (5.5 eurocents) for the first 100 kWh⁹⁸ and about J\$ 5.8 (7.8 eurocents) for all subsequent kilowatt-hours. This is then supplemented by a fuel price of roughly J\$ 2.8 (3.8 € cents/kWh), which is subject to regular adjustment and which takes account both of the purchase prices for the fossil energy sources and the payments made to the independent power providers. Tariff increases planned for the summer of 2004 envisage an increase in the standing charge to J\$ 87 (€ 1.18) and in the basic prices to J\$ 6.1 and 8.7 respectively (8.3 and 11.7 € cents/kWh), which would signify a real price increase of more than 13% for residential customers.

Market Actors

Jamaica Public Service Co.

The utility company responsible for a large proportion of electricity generation and for the transmission and distribution of electricity is the Jamaica Public Service Co. (JPS). The previously state-owned enterprise was to have been privatised in 1996, although the corresponding regulatory framework conditions were not in place. A public tendering process to bring this about failed.

Following direct negotiations with interested investors, since March 2001 JPS has been 80%-owned by the US company Mirant⁹⁹ and has operated on the basis of a licence issued within the scope of privatisation. In accordance with this licence, JPS will function as a single buyer on the electricity market until the year 2021 and enjoy a monopoly in transmission and distribution.

Independent power producers and self-generators

In addition to JPS, a further three independent power producers contribute to public supplies with a capacity of 145 MW. The following companies have a licence for power generation and supply contracts with JPS: Jamaica Energy Partners (since 1995, 74 MW), Jamaica Private Power Company (since 1994, 60 MW) and Jamalco-Alcoa Minerals of Jamaica (since 2000, 11 MW).¹⁰⁰

Some companies generate electricity for their own needs. These include bauxite/aluminium producers, sugar factories and a cement manufacturer.

Petroleum Corporation of Jamaica (PCJ)

The Petroleum Corporation of Jamaica (PCJ) was founded by the Jamaican government as a corporation under public law in 1979, and was entrusted with the exclusive task of ensuring the supply of oil to the country. Reducing the dependency on imported oil is a crucial objective of PCJ, and explains its enhanced commitment to renewable forms of energy. PCJ was given the task of developing and using alternative energy sources by the government in 1995.¹⁰¹ Not only will PCJ act as the operator of a large wind farm that is currently being built, it also has experience in the hydropower, biomass and solar energy sectors.

Office of Utilities Regulation (OUR)

Against the background of the increasing privatisation of Jamaican state-owned enterprises, the cross-sectoral regulatory authority Office of Utilities Regulations (OUR) was called into existence on the basis of the Office of Utilities Regulation Act of 1995. Its central tasks in respect of the electricity sector are the creation of a competitive environment, the monitoring of electricity tariffs and consumer protection. Expansion of the use of renewable energy, however, is also supposed to be supported by the OUR.

Responsibility for the energy sector

Since October 2002 the ministry responsible for the energy sector is the Ministry of Commerce, Science & Technology.

Legal Framework

The legal basis for the electricity sector is provided by the Electric Lighting Act of 1893 (with a series of subsequent amendments) and the Electricity Development Act of 1974. At the end of the 1990s a start was made with formulating a new electricity act, but it was then postponed again. A new draft is now expected to be submitted in 2004.

97 All figures relate to April 2003.

98 This charge, referred to as a "lifeline rate", is a cross-subsidised tariff for poorer members of the population.

99 Further interests are held by the Jamaican state or are in widely spread holdings.

100 The contract with a fourth producer, EAL/ERI Cogeneration Partners, was terminated in December 2003.

101 Because of a lack of specific political powers, the influence exerted by PCJ on energy policy is limited.

Another provision that is equivalent to a statutory regulation is the licence issued in April 2001 (All-Island Electricity Licence 2001) on the basis of which JPS is authorised to generate, transmit and distribute electricity for private and public purposes for a period of 20 years. The licence grants JPS the exclusive right to expand its power station base up until April 2004. After that date the expansion of power generating capacity will be achieved through public tendering processes, in which JPS can participate. Other private generators are permitted to sell electricity to JPS, with such transactions being monitored by the regulatory authority OUR.

Energy Policy Paper

The fundamental direction of energy policy was last set out in the Energy Policy Paper published in 1997. A new edition of the policy paper is expected to appear at the beginning of 2004. Among other things the energy policy targets the development of domestic energy sources, provided this is economically and technically feasible. It is also planned that combined heat and power generation should be expanded by the private sector, and clear rulings on the purchase of electricity from such plants are demanded. Tax privileges for solar-electric systems are supposed to be retained. Electricity supply companies will also be allowed the possibility of apportioning special expenditure on improving energy efficiency to the electricity tariffs.

Energy policy objectives

The Jamaican government expects to achieve efficiency gains in the electricity sector through the privatisation and liberalisation measures (now introduced) that are aimed above all at steering private capital into building the required power plants. A reduction in the heavy dependence on oil imports is to be achieved through the diversification of energy provision, including that from renewable sources. There is also considerable interest on the part of the state in making (imported) liquefied natural gas available for power generation in particular. Environmental pollution from fossil energy sources and firewood is to be held in check.

JPS is obliged to submit a Least Cost Expansion Plan for cost-effective expansion of the supply sector over the long term. A new plan covering a time span of 11 years was submitted to the OUR for review in October 2003.¹⁰²

Clean Development Mechanism

The Kyoto Protocol was adopted in June 1999 but has not yet been ultimately ratified.

Policy for Promoting Electricity Generation from Renewable Energy Sources

To date, very few or only inadequate measures have been taken at the political level in Jamaica to exploit the potential of renewable energy sources. A lack of awareness of the advantages of renewable energies, not only among political decision-makers but also within the dominant power utility, in industry, commerce and generally throughout the population, constitutes a significant barrier.

In 2003, though, against the background of the massive burden on the budget from imported oil, the government announced greater support for renewables. To bring this about, a department responsible for energy efficiency was set up in the competent Ministry of Commerce, Science and Technology; this department will also take care of the promotion of alternative energy sources.

Focus on energy saving

The main focus in relation to a sustainable energy policy is placed on the promotion of efficiency measures. One important promotion programme aimed at increasing energy efficiency was the Demand Side Management Demonstration Project, which was implemented in the second half of the 1990s with GEF assistance. Solar-thermal and solar-electric installations were also brought into use within this framework. At present the government is planning to institute an energy fund amounting to US\$ 100 million. The intention is that households and companies should be assisted through this fund not only in implementing energy-saving measures but also in the installation of solar-thermal installations. It is not known that the planned energy fund will provide any appreciable support for renewable energy technologies designed to generate electricity.

The Energy Policy Paper of 1997 lists various incentive mechanisms for the promotion of renewable energy sources. Some of these measures, however, were cut when the national budget for 2003 was drawn up.

¹⁰² In addition, in 2003 the OUR commissioned a Generation Market Study in which the various options for the future expansion of power-station capacity will be examined. This will explicitly take account of renewable energies.

In comparison with the average remuneration for generation from fossil sources, a higher purchase price (up to 15% more) is offered for electricity from renewable energy sources.

GTZ-UNDP/GEF programme

In order to reduce the heavy dependence on oil imports and to boost the use of renewable energy resources in a total of 16 island states in the Caribbean, the GTZ and UNDP/GEF set up the Caribbean Renewable Energy Development Programme (CREDP). The project is scheduled to run for ten years, with its initial phase extending from 2002 to 2007. The executing institution is CARICOM (Caribbean Community). The programme is based on four components:

- assistance with the drafting of political guidelines, laws and regulations that are intended to establish the framework for the expansion of renewable energy use
- the introduction of innovative financing methods and dissemination of these methods to companies with the aid of demonstration projects
- support for promoters of renewable energies and institutional capacity building
- establishment of an improved regional information network for renewable energy sources

Status of Renewable Energy Sources

In 1998 the proportion of renewable energy sources in primary energy generation amounted to some 9%, within which bagasse accounted all in all for a share of 5.5%, firewood 2.6% and hydropower 1%. There was no discernible upward trend in the use of alternative energy applications apparent over the preceding years.

Hydropower

The hydrological and geomorphological conditions in Jamaica almost exclusively permit the use of small-scale hydropower installations. The technical potential is put at approximately 100 MW. Apart from one possible hydroelectric power station in Black Rio Grande with a capacity of 50 MW, all potential new plants would have a capacity of less than 10 MW, and most of them in fact

below 5 MW. The additional economic potential available over and above present use is estimated at 60 MW.

Installed plants

The installed nominal capacity currently totals almost 24 MW. The capacity of plants in working order and feeding electricity into the grid amounts to 21.4 MW. However, no new plants have entered operation for the past 15 years. Hydropower thus contributes between 2 and 3% to today's electricity resources for public supply. All of the plants are in the ownership of JPS and have only recently been reconditioned with financial assistance from KfW.

Plant location	Date of commissioning	Installed capacity
Upper White River	1945	3.8
Lower White River	1952	4.9
Roaring River	1949	3.8
Rio Bueno A	1949	2.5
Maggotty Falls	1966	6.3
Constant Spring	1989	0.8
Rams Horn	1989	0.6
Rio Bueno River	1989	1.1
Total		23.8

Table 21: Capacity of hydropower plants; Jamaica; MW (nominal) ¹⁰³

The reasons for neglecting expansion are to be found in the high capital costs, high interest rates and the low feed-in tariffs offered by the national power utility JPS in recent years. As far as JPS is concerned there are no plans to expand electricity generation from hydropower.

Wind Energy

According to various estimates, wind power could contribute between 45 and 70 MW to electricity supplies by 2010. This would be roughly equivalent to 4.5 to 7% of the projected electricity generating capacity or 3 to 5% of electricity production (public supply only) for that point in time. The total economic potential is estimated at 110 MW. Locations with favourable wind conditions are found above all on the coastal strips in the parishes of St. Thomas, Clarendon, Manchester, St. Elizabeth, St. Ann, St. Mary and Portland.

Previous use

To date, wind energy has played almost no role in generating electricity in Jamaica. The first wind power plant of modern design was built as a demonstration project in 1995 in the parish of St. Elizabeth (Munro College), and feeds electricity into the grid with an output of 225 kW. Erection of the system was preceded by wide-ranging wind measurements in the vicinity of the subsequent site. One organisation involved in the measurements was the Department of Renewable Energy within the Institute for Physics at the University of the West Indies, which since then has been investigating the implementation of further schemes.

Wind measurements

A substantial increase in the significance of wind energy is expected to be seen in 2004. Commissioning of the 20.7MW (23 x 900 kW) Wigton wind farm in the interior of the country (Manchester Parish) is scheduled to take place in the second quarter of 2004. Wind measurements were conducted at this and other locations from 1995 onwards for the purpose of yield forecasting. The six-year data series obtained at the Wigton site revealed an average wind velocity of 8.1 m/s.

Wigton wind farm

The initiators of the project are PCJ and a British company, while the operator will be a subsidiary of PCJ. The wind farm will contribute an estimated 2% of present-day electricity production for public supply.

The investment costs of the Wigton wind farm will amount to approximately US\$ 25 million. In addition to financial support from the Dutch Government¹⁰⁴ and participation by PCJ, a loan was raised from the National Commercial Bank of Jamaica. In the first five years the electricity supply company JPS will pay a feed-in tariff of 5.6 US cents/kWh, and from the 6th to the 20th year about 5.1 US cents/kWh. The possibility of selling emission certificates is also under investigation at present.¹⁰⁵

Biomass

In principle the following resources lend themselves to use for the recovery of energy in Jamaica:

- agricultural residues (especially Bagasse)
- agro-industrial waste and residential waste
- aquatic biomass, aquatic plants
- green wood and wood residues

Bagasse

Bagasse arises as a residue in sugar factories, and until now along with hydropower has been the most important renewable energy source in Jamaica. Bagasse is incinerated in combined heat and power stations on-site at the processing facilities, and makes a contribution to the provision of electricity and heat. In 1998 the total electricity generating capacity of the eight sugar factories amounted to 30 MW. At the times of year when there is no harvest, the power stations are fired by coal. A project implemented by PCJ is investigating how to make more efficient use of bagasse in two sugar factories.

Wood as a fuel

Wood, and charcoal obtained from wood, are popular fuels in households, where they are predominantly used for cooking. One problem in this connection is seen to be the increasing rate of clearances and wood removal, which runs counter to a sustainable system of forest management. Since 1995 PCJ has run timber plantations for research and demonstration purposes, four of which it is still looking after at the moment, in order to make a contribution to the provision of firewood in the long term.

Biogas projects and GTZ promotion

In the early 1990s a biogas programme was implemented under the auspices of the Ministry of Mining and Energy, as it was at the time. 41 biogas plants were built as part of that scheme. The GTZ has promoted biogas projects run by the Department for Waste Management at the Scientific Research Council (SRC). Among others these have included the further processing of slurry on two pig farms and the subsequent use of the gas in households. The SRC is an important state research and development institution which focuses on the agro-industrial sector.¹⁰⁶

¹⁰⁴ In addition to an export credit to the tune of US\$ 5.8 million, the Dutch Government has also granted subsidies within the framework of the Dutch export and environmental programme ORET/MILIEV.

¹⁰⁵ The project has been placed on the shortlist for the Dutch CERUPT system.

¹⁰⁶ The SRC is also responsible for the Caribbean Energy Information System (CEIS), which gathers information about the energy sector in the Caribbean and makes it generally available. The College of Agriculture, Science and Education (CASE) also looks after projects in the field of wastewater treatment and biogas, and uses the projects for educational purposes oriented towards practical use.

The additional economic potential of solid waste is estimated at 20 MW, and that of bagasse and firewood together at 35 MW.

Solar Energy

With a daily solar irradiation rate of between 4.1 and 5.6 kWh/m², the natural conditions for the exploitation of solar energy in Jamaica are very good.

Whereas solar-thermal applications are seen relatively frequently, the distribution of photovoltaic applications is still in its infancy. Apart from about 220 solar-powered street lights, 50 localised individual systems for residential users (solar home systems) have been installed in two villages by JPS as part of an energy efficiency programme. A small number of on-site PV systems have also been set up by commercial actors.

Among non-governmental organisations, the Jamaica Solar Energy Association (JSEA), which was founded in 1999, is particularly active in the solar sector. Its members comprise manufacturers, dealers, and representatives of the relevant trades and the scientific community.

The Renewable Energy Studies department within the Institute for Physics at the University of the West Indies (UWI) is looking into the efficiency of solar cells and modules. It is also investigating the economic efficiency of tracking systems. In order to ensure a reliable power supply for laboratory instruments, a PV system with an output of 700 W was installed. There are plans to expand this installation considerably.

Geothermal Energy

Geological warm-water reserves have been discovered in the Blue Mountains. According to experts' estimates, the temperatures are sufficient for the provision of heat but not for the generation of electricity.

Rural Electrification

According to a poll conducted in 2001, an estimated 86% of the population has a connection to the main electricity supply.

REP

In order to accelerate the electrification of rural areas the Rural Electrification Programme Limited (REP) was set up in 1975, the primary task of which is to expand the electricity grids. REP concentrates mainly on non-commercial projects, and in the long term is pursuing a goal of almost one-hundred-percent electrification. In order to achieve a hundred-percent mains connection rate and to be able to supply electricity to the remaining 25,000 households, REP states that approximately 1,360 km of new transmission lines would have to be erected. Plans to expand the power grid are coordinated with the national electricity supply company (JPS). The latter is also obliged to purchase the newly erected infrastructure. In the event of disputes, the regulatory authority OUR acts as a mediator. The targeted objective for the 2002/2003 financial year was to connect 5,000 houses, and according to the OUR this was 80% achieved.¹⁰⁷ Approximately 3,000 houses are due to be connected in the 2003/2004 financial year.

Building up localised supply

In addition to expanding the grid, in future REP would also like to concentrate more on building up localised energy systems. The Demand Side Management Demonstration Project implemented under the aegis of the World Bank and with GEF funds from 1992 to 1999, which was primarily oriented towards energy efficiency measures, focused on thermal applications in the solar sector, but it also included a small component involving the electrification of off-grid households in two communities by means of solar home systems. In future the management of REP intends to call upon financial support primarily from European countries or the EU.

Exchange rate (11 March 2004): 100 Jamaica dollars (J\$) = € 1.35

¹⁰⁷ According to information from the management of REP, the objective was achieved in full.

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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**.



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