

**B**razil is the largest and, with 186.8 million inhabitants, the most populous country in South America. In the light of the economic upswing and growing affluence, the energy demand has been steadily rising. Brazil is already a world leader in the implementation of renewable energies. According to the country's Ministry of Mining and Energy (MME) and federal energy planning company Empresa de Pesquisa Energética (EPE), the share of renewables in the total energy consumption reached 46.4 % in 2007. The largest contribution of 30 % and 15 % came from biomass and hydroelectric sources, respectively. Since 2003, EPE says, more than 15 GW of new capacities were added in both areas. But electricity demands have been exceeding the capacities for

a long time. On the one hand, the Amazon region is abundant in hydro potential. On the other hand, the environment is at risk and transmission to the south-east where most energy is needed is problematic. EPE President Mauricio T. Tolmasquim says transmission lines will be considerably expanded: "This year, about US\$ 1.7 billion will be allocated towards expanding Brazil's transmission infrastructure by 6,000 km." According to Brazilian "Plano Nacional de Energia 2030", the share of renewables in the total consumption must not fall below the current level for at least 20 years. To achieve this target, other regenerative sources, in particular wind energy, will be further promoted. The issue will be addressed in Rio de Janeiro from March 17 to 19, 2009 during "RIO 9 – World

When it comes to biofuels, Brazil is recognized as world leader. However, the phase-out of the Proinfa incentive raises doubts whether other renewable energy forms such as wind energy will still be able to catch up. A number of new promotion schemes are now underway.

# Ecologically sound

The wind and land conditions in Brazil are excellent, but wind energy systems are still underrepresented. There are only few wind farms like this one in the south of Brazil.

Photo: Enerfin

Climate & Energy Event". The conference will be flanked by Latin America Renewable Energy Fair "LAREF 2009". However, with about 1,000 visitors per day and about 30 exhibitors from across the globe, LAREF 2009 is considered an insiders' tip. "Due to the financial crisis, sponsors and exhibitors are rare at the moment. But we are ambitious to make the event a success", says organizer Elena Kempf. International players are already becoming aware of the Brazilian market potential.

### **What will come after Proinfa?**

Rio will bring together industry members and politicians to discuss the details of future incentives.

Brazil's first and only national incentive "Programa de Incentivo a Fontes Alternativas de Energia Elétrica" (Proinfa) phased out in 2008. The government initiative had started in 2002. While unfinished projects can still be realized, experts doubt that Proinfa itself will be prolonged. More probable a scenario seems the creation of new incentives.

Proinfa's scope embraces wind, small-scale hydroelectric and biomass with subsidies and tariffs for about 3.3 GW of renewable power generation. The programme projects 1.1 GW for each energy form, later raising the cap for wind energy to 1.4 GW. The tariffs for the different types of biomass initially ranged between 32.2 and 58.1 US\$/MWh. Electricity from hydropower received 40.2 US\$/MWh. Wind





energy obtained the best tariff of 61.9 to 70.2 US\$/MWh depending on installed capacities. The tariffs for all energy forms are adjusted to inflation. Brazilian power holding Eletrobrás is obligated to purchase and distribute electricity generated from green sources. The programme is financed through a surcharge on the consumer's electricity bill. One of Proinfa's main goals is to support the local economy. 60 % of the construction costs for the installations must arise due to components and services of local companies. The capacity targets, however, have not been met yet. "The programme is behind schedule. Some investors retained their power plants to speculate prices on the market. Ownership ran from hand to hand and construction of these plants never started", says Roberto Devienne Filho of Network of Civil Society Organizations for Renewable Energies (Renove).

### Bioethanol: Strong by tradition

Years before Proinfa, Brazil had already launched a national promotion of bioethanol. The main goal of the 1970s' programme was to lower oil dependence. Today, the country is second-largest bioethanol producer behind the United States and global export leader. While biofuel is in most countries obtained from wheat or corn (maize) feedstock, the prime source of Brazilian ethanol is sugar cane. The country's enormous capacities go back to a strong industry in the south-central and northeast regions. 54 % of the sugar cane industry's total turnover of US\$ 20 billion in the last crop season came from ethanol production. Objections that farm land should rather be used to feed the population can be countered by the fact that Brazil is abundant in agricultural

Solar thermal systems with an installed capacity of about 2.5 GW<sub>th</sub> make use of Brazil's abundant sun power.

Photos (3): Unasol



### Key figures for Brazil

Surface	8.5 million km <sup>2</sup>
Capital	Brasilia
Population	196.3 million (2008, est.)
GDP per capita	US\$ 10,300 (2008, est.)
Primary energy sources	oil and derivatives: 37.7 % biomass: 30.2 % hydropower: 14.8 % natural gas: 9.4 %
Installed capacities (2008)	
Wind:	340 MW
PV:	20 kW
Solar thermal:	2.5 GW <sub>th</sub>

Sources: CIA The World Factbook, solarthermalworld.org 2008

areas. According to the Brazilian Sugar Cane Industry Association (UNICA), about 2.2 % of the available agricultural land is currently used for cultivation of sugar cane. The prime growing regions and plantations are located in the central south and the north-east. UNICA indicates that about 22.5 billion litres of bioethanol were derived from sugar cane in the last crop – one third of the world production. Production costs of 25 US-cent per litre are the cheapest worldwide. In the eyes of UNICA, oil prices of US\$ 40 per barrel make bioethanol economically favourable. Several hundred mills around the country contribute to biofuel production. "The financing crisis has taken its toll on the sector. High debt and financing ratios besides the present liquidity squeeze pose challenges", says Norbert Schmitz, Partner of meó Consulting Team and expert for the Brazilian bioethanol market. According to Schmitz, most investors are Brazilian. Cosan, one of the country's largest bioethanol producers with about 1 billion litres sold during the fiscal year 2006, and the cooperative Copersucar S.A. with 33 mills in three states, stand out as key players. Bioethanol exports have been rising for years and last year accounted for 15 % of the overall revenue. UNICA President Marcos Sawaya Jank does still not believe that Brazil will focus on export for the world market: "Brazil does not intend to supply ethanol for the rest of the world. We are part of the solution, not the solution." However, bioethanol plays an important role in the country's energy mix. 50 % of petrol consumption, says UNICA, is delivered by bioethanol today. In 2003, the introduction of Flexible Fuel Vehicles (FFV) able to run on any gasoline and ethanol blend, from mandatory 20 to 25 % to pure ethanol, brought an upswing for the sector. One fifth of Brazil's vehicles today run on flexible fuel. But the country is more ambitious and wants to achieve a share of 50 % until 2012.

### Biodiesel sector restructuring

Besides bioethanol, biodiesel is considered as one of the major energy sources in Brazil. Since July 2008 the National Biodiesel Production & Use Programme (PNPB) has made 3 % biodiesel blended in conventional diesel fuel obligatory. 5 % has been targeted for 2013 with the annual production raised from

1 million to 2.4 million tonnes. "The target does not require higher soy production", says Daniel Furlan Amaral, economist at the Brazilian Oilseed Processors Association (ABIOVE). Soy is the main ingredient for Brazil's biodiesel. While the ecological fit is, for example, rooted in the need for energy security in the United States, the bioethanol sector in Brazil has also a social aspect. "Soy production involves a large number of producers, many of them small-scale and agricultural cooperatives. So jobs are created in rural areas", says Amaral. In 2005, the "Social Fuel Seal Programme" introduced a national auction system to involve rural farmers into the production processes. The programme enforces minimum purchase quotas for raw materials from agricultural communities. In addition, the government introduced tax shelters and financial incentives especially for family farms and production in the northern and north-eastern regions. In 2007, Brasil Ecodiesel dominated the market with a share of 53 %. However, in 2008, the picture changed. By then, the four major manufacturers Granol, ADM, Brasil Ecodiesel and Caramuru held individual market shares of 10 to 20 %. Brasil Ecodiesel's losses mainly owed to bad investment decisions, insufficient protection against price volatility and higher numbers of competitors, says Amaral.

Official figures indicate that Brazil was home to about 65 factories in 2007. Meanwhile, increasingly more global players look towards Brazil for a production location. For example, collaboration between

The "Taiba Albatroz" wind farm with a total installed capacity of 16.5 MW is operated by Bons Ventos Geradora de Energia.

Photo: Bons Ventos Geradora de Energia

Agrenco Gruppo and Marubeni Corporation from Japan led to the founding of Agrenco Bioenergia. But also domestic companies are planning to build new factories. State-owned oil giant Petrobrás, for example, plans construction of three new factories. However, whether the additional biodiesel capacities will at all be necessary is an unanswered question. According to the National Petroleum Agency (ANP), only one fourth of the country's total production capacities are used today.

### Outstanding solar thermal

Besides the powerful biofuel industry, another strong industry branch today is the solar thermal sector. According to internet portal solarthermalworld.org, the total installed capacity in 2008 ranged at 2.5 GW<sub>th</sub>. The Ministry of Mining and Energy (MME) indicates 3.1 million m<sup>2</sup> of collector surface had been installed by 2007 with an annual growth of 14 %. "Solar



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**In Brazil, solar thermal systems are mainly used in residential buildings, hotels and the service industry.**

thermal mostly concerns residential buildings and solar pool heating”, says José Augusto Lawisch, CEO of Unasol Energias Renováveis, producer of solar hot water systems. Presently, resident buildings account for about 84 % of the installed solar thermal collector surface, hotels and services for 15 % and the industries for merely 1 %.

However, a national promotion scheme for solar thermal energy is still missing. On the municipal level, for example, in São Paulo and Niterói, the utilization of solar thermal is in some cases mandatory. “These regulations are brand-new and the government has not installed audits to guarantee people adhere to the law”, argues Roberto Devienne Filho of Renove. But the professional expects that a national promotion programme could soon become a reality. Approximately 73.3 % of the population use electrical flow heaters for their showers. These systems could be easily replaced by solar water heaters. “Elec-

tric water heaters are not expensive but eat a lot of power. Solar water heating would provide a cheap solution”, says Lawisch. The promotion and utilization of solar thermal is aimed in particular at poor districts and regional pilot projects. In the opinion of Laura Porto, Director of Energy Development Division at MME, the absence of a national promotion scheme is a particular obstacle for stronger

growth in the sector. Currently, the market is shared by 140 solar thermal manufacturers that produce a cumulative collector surface of about 400,000 m<sup>2</sup>. Lawisch says less than 10 % is exported. A recent study by Gruppo de Estudos em Energia and Pontifícia Universidade Católica de Minas Gerais recommends that especially the quality of the installations should be improved. Because of the low standards, a large-scale system in Rio de Janeiro built in 2006 for solar indoor pool heating already had to be shut down. To provide a solution, Programa Brasileiro de Etiquetagem introduced a quality seal that has become mandatory since 2007. The fact that many mu-

nicipalities lack qualified installers led to the creation of another initiative called “Programa QUALISOL”, which provides retailers and installers with professional trainings.

## Wind energy market still small

While solar thermal and biofuel find wide application in Brazil, wind energy systems are still under-represented. “However, wind and land conditions are excellent and very attractive”, says Ralf Heidenreich of juwi Holding AG from Germany. The best opportunities for wind plants exist along the north-eastern coast. According to Brazilian wind energy association Associação Brasileira de Energia Eólica (ABEEólica), the total installed capacity currently ranges at 340 MW with a potential of 143 GW, not including offshore. After the national incentive Proinfa phased out and the last projects are being completed, the sector is now facing an uncertain future. Soon, Brazil’s government will for the first time hold a wind power auction. Pesquisa Energética (EPE) is expected to present a suitable concept to the Ministry of Mining and Energy (MME) in the first months of 2009. “We are working on a programme that will annually promote 1000 MW of wind energy over a period of 10 years”, says Lauro Fiuza Jr., President of ABEEólica. “Investors for wind projects will not be attracted unless the electricity produced receives a fixed tariff over several years”, says Roberto Meira Jr. of MME. So far, the only companies with a production site in Brazil are Windpower Energia SA (WPE), a subsidiary of multinational IMPSA and Wobben Windpower Ind., a Brazilian subsidiary of Enercon. In 2002, Wobben Windpower launched two production facilities for turbines between 0.9 and 2.3 MW. Only last year, WPE inaugurated its production of 1.5 MW turbines. Proinfa poses particular challenges for foreign manufacturers as wind projects must include a minimum of 60 % local content. “The rule slowed down many wind projects”, says Fiuza. The new incentive will be different in that respect and open the market for international competitors. The world has a great interest in the Brazilian wind market. In the past, the sector was



**Solar professionals wanted: The demand for qualified installers in Brazil is high.**

# inter solar 2009



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On-grid PV systems are rare in Brazil. A system with a capacity of 10 kW is located on the premises of Universidade Federal de Santa Catarina.

Photo: Renove

largely dominated by Enercon. New wind projects now also invite other international manufacturers. Suzlon, for example, supplied component parts for the recent “Bons Ventos” wind project with a capacity of 155 MW.

### PV: mostly small-scale applications

Similar to the wind market, the Brazilian PV sector is still far behind its potential. Global irradiation levels of 1,600 to 2,300 kWh/m<sup>2</sup> per year next to electricity prices of more than US\$ 0.26/kWh create an ideal environment for utilizing PV. But the main application area is still the off-grid sector. Filho of Renove estimates that the total installed capacities range at about 20 kW. Brazil’s large-scale rural electrification programme “Luz para todos” (“electricity for everyone”) was introduced with the target to include remote villages in the economical growth. “2.5 million households will receive access to electricity. 1.5 million are already connected. The aim of the German-Brazilian cooperation is to give more weight to renewable energy systems”, says Dirk Assmann of German Technical Cooperation Agency (GTZ). “In some regions, PV is simply the best solution, especially when electricity demand is low but distances between individual consumer groups are large”, says Laura Porto of MME. Incentives for on-grid applications are still missing. For that reason, a work group of the House of Representatives is currently discussing details of a new legislation, says Filho. The first Brazilian on-grid BIPV system was installed in 1997. Isolated systems such as a 12 kW and a 10 kW installation on the Universidade de São Paulo and the Universidade Federal de Santa Catarina, respectively, were added later. A more recent project concerns so-

lar installations for national airports. Only two manufacturers are currently active in Brazil: Rima Industrial, a producer of silicon-based alloys, and Heliodinâmica, South America’s only PV equipper covering the entire value-added chain from ingot to modules. Bruno Topel, President of Heliodinâmica, did not want to make statements on the current production capacities. “Our company has been on the market for some thirty years now and the situation has definitely improved. The ‘Luz para todos’ programme has been important for our sales. So we are looking forward to the new incentive”, says Topel. The news of Brazil’s new incentive has meanwhile spread as far as Hungary where ErgoSolar produces equipment for thin-film factories. “The incentive will produce a higher interest in manufacturing”, says Sales and Marketing Manager Norbert Nagy. Rio will therefore be worth a visit for ErgoSolar. Industry representatives expect valuable details on the incentive during RIO 9. SUN & WIND ENERGY will cover the event.

Nina Schwab and Stefan Hausmann

#### Further information:

Brazilian Wind Energy Association: [www.abeeolica.org.br](http://www.abeeolica.org.br)  
 Brazilian Oilseed Processors Association: [www.abiove.com.br](http://www.abiove.com.br)  
 Agreco Group: [www.agreco.org.br](http://www.agreco.org.br)  
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 Eolica Technology: [www.eolica.com.br](http://www.eolica.com.br)  
 Fuhrländer: [www.fuhrlaender.de](http://www.fuhrlaender.de)  
 Brazil’s largest renewable-energy NGO network Renove: [www.renove.org.br](http://www.renove.org.br)  
 Wobben Windpower Ind: [www.wobben.com.br](http://www.wobben.com.br)  
 RIO 9 - World Climate & Energy Event: [www.rio9.com](http://www.rio9.com)  
 Unasol: [www.unasol.com.br](http://www.unasol.com.br)  
 Brazilian Sugar Cane Industry Association: [www.unica.com.br](http://www.unica.com.br)

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