Brazil's Market for Small Hydro Power Plants
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Overview

Brazil has a large and diversified economy that offers US companies many opportunities to export their goods and services. As Brazil's largest single trading partner, the US enjoys a strong reputation in a variety of sectors. This report is one of a series that is published by the US Commercial Service's team of sector experts throughout the year. We believe that the Brazilian market for small hydro power plants presents US companies an excellent opportunity to do business with Brazil. If you do not see an opportunity for your product or service here, please check out our other reports and consider contacting us directly to find out if we can help you export to Brazil.

Summary

Brazil has excellent hydrological resources and one of the world's highest hydroelectric capacities. Approximately 77% of Brazil's electricity is generated by hydroelectric power plants and Brazil accounts for nearly 12% of the world's hydroelectric power supply. There is still untapped potential for hydroelectricity in the country, especially for small plants.

Although Brazil's north and south have complementary rainy seasons, the country relies so heavily on hydropower that it is particularly exposed to extended drought. In 2001, for example, the country faced severe energy shortages and a severe rationing program. The brownouts experienced in California were far less dramatic than the severe energy shortage faced by Brazil in 2001. This episode spurred Brazil's federal government to make the diversification of its energy matrix a top priority.

Brazil has a long tradition of Small Hydro Power Plants (SHP), since the 19th century. In the second half of the 20th century however, due to the vast and rapid increases in demand for electricity, the country developed only very large hydro projects, and SHP projects were completely neglected. The number of SHP's in operation actually fell sharply during this period, as they were less competitive than large projects.

Recently, however, the potential for large hydro power plants became dwindled as the best sites for major hydro projects have already been tapped. The development of new SHP's accordingly become of utmost importance to cover the fast increasing demand for electricity, particularly if Brazil is to avoid energy shortages akin to those faced in 2001.

The PROINFA Program

In 2002, the Brazilian federal government created the PROINFA program for the development of alternative energy sources. In essence, the program seeks to guarantee the purchase of 3,300 MW of electricity from small alternative sources, which must start commercial operations by December 30, 2008.

PROINFA defines an SHP as follows:

- 1,000 to 30,000 kW of installed capacity.
- Maximum flooded are of 3km2.
- Use of generating units of 5,000 kW maximum each.
- Maximum flow rate of 2m3 per second.
- Maximum dam height of 10 meters.
- No tunnels.

PROINFA is expected to attract US$ 2.5 billion in new investments during the period from 2005 to 2008. These new PROINFA sponsored investments include SHP, wind and biomass energy generation. Small projects are defined by the program as having a maximum installed capacity of 30 MW.

The PROINFA program supports the development of these alternative sources of electricity with low cost financing. Under the program, the federal development bank (BNDES) is responsible for financing up to 80% of the total cost of a plant at very favorable interest rates. Under the program, the remaining 20% must be financed by equity capital.

Additional Benefits Received by SHP

SHP projects of less than 30 MW, regardless of whether they are part of the PROINFA program, also receive additional benefits. As follows:

- They receive a 50% discount on fees for transmission and distribution of electricity.

- They are also allowed to sell as little as 500kW of electricity as opposed to the 3,000 kW required for larger plants into Brazil electricity "free market".
- One final, and key advantage of small projects is that their construction and operation depends only on an authorization by ANEEL, as opposed to a mandatory auction for a concession of larger projects.

There are also some other possibilities of financing for these projects, such as regional development banks, private equity funds, securitization, and Power Purchase Agreements with large industrial consumers. The largest private equity fund set up for this purpose is called "Brasil Energia," with US$280 million from private pension funds and BNDES. Another important fund is the "Fundo EcoEnergia," registered at Brazil's Comissão de Valores Mobiliarios (CVM), Brazil's stock exchange regulatory agency, similar to the SEC.

The Brazilian federal government, through public electricity holding company, Eletrobras selected in 2004 the projects that are eligible to sell energy to the national grid in 20-year contracts (PPA) with autonomous independent producers. A few of these projects were changed afterwards, or transferred in ownership. In order to qualify for the PROINFA financing, a minimum of 60% of the value of the project procurement must be of Brazilian-made equipment.

After PROINFA's initial goal of 3,300 MW is installed (planned for December 2008), a second phase of PROINFA will immediately follow, to ensure that 20 years hence, wind, biomass and SHP will supply 10% of Brazil's annual electric power consumption. For the second phase, only projects with at least 90% of Brazilian-made components (in terms of the final value) will be eligible for BNDES financing.

Currently there are a total of 63 SHP projects approved for operation under PROINFA rules, with a combined installed capacity of 1,191.4 MW. Construction of 15 of them is already underway, with a combined installed capacity of 290.7 MW.

During 2005, the BNDES approved approximately R$1 billion (US$415 million) in financing for 15 SHP projects in Brazil, with a combined installed capacity of 360 MW, through the PROINFA program. The combined total of all projects approved for BNDES financing under the PROINFA rules in early January 2006 is R$2.1 billion, for 29 projects, with an installed capacity of 763 MW, located in 11 Brazilian states (including wind power and biomass projects).

The maximum possible financing support for a project under PROINFA was raised in March 2004 to 80% from its initial value of 70%. This decision was made due to the fact that the number of projects initiated began to diminish due to the fact that many small independent firms were finding it difficult to meet guarantee requirements to in order to raise the minimum 30% equity.

If a project selected for PROINFA financing does not start commercial operations by December 30, 2008, it will have to pay heavy fines, according to ANEEL rules. For this reason, all pending projects are expected to start construction by the end of 2006. Several engineering contractors developed SHP projects under PROINFA, for later sale to potential investors. A number of SHP's have already been sold to new investors.

Sales of the generated energy has not been a problem for SHP project owners. There is strong demand and all electricity offered by SHP's under contract have, so far, been sold.

Obtaining environmental licenses has presented a problem in a number of instances. The license must be granted by state authorities, not federal, and time spent dealing with bureaucracy has varied greatly by state. In general, investors have reported that procedures have been taking longer in the states' of Minas Gerais and Paraná and less time in the states of Rio de Janeiro and most of the state's in Brazil's northeastern region.

Current and Future Electricity Production

According to data published by ANEEL, Brazil's National Agency for Electric Energy, Brazil had 2,020 hydroelectric plants in 2005. Of these plants, 1,428 are operating and generating 91,995,728 kW of electricity.

Currently, Brazil has 431 SHP's which generate a total of 1,420,803 kW of power, equivalent to approximately 1.5% of Brazil's total installed hydro power generation.

ANEEL also reports that 76 new hydro plants are being built which will generate a total of 6,910,645 kW of energy. Out of this amount, 501,290 kW will be generated by 41 new SHP's. These 41 new SHP's include projects both within and without the PROINFA project.

Opportunities for Refurbishing Old SHP's and MHP's

There also exist excellent opportunities to refurbish and re-power old and / or inefficient small and micro hydro plants. According to CERPCH, the National Reference Center for Energy from Small Hydro Plants, Brazil has about 427 decommissioned plants whose average size is 0.4 MW. In addition, there are about 1,040 SHP's whose conditions are unknown to CERPCH, but most probably include a large number of plants in need of refurbishment.

Most of the SHP's are located in the Southern and Southeastern regions of Brazil. In recent years, the Midwest region has also developed many new SHP's. The North has plentiful hydrology resources, due to the Amazon and its tributaries, but offers few promising potential sites due to its relatively small population, flat landscape and dense forest vegetation.

State's with largest numbers of SHP's

Minas Gerais is the state with the largest number of SHP plants in operation in Brazil. The state has 77 SHP's, which have a combined capacity of 397,697 kW.
The state of São Paulo has the second largest number of SHP's totaling 35 plants.

Thereafter, Brazil's Southern states have the largest number of plants those being Paraná with 30 plants, Santa Catarina with 22 plants and Rio Grande do Sul with 20.

For further information on SHP plants by state, their respective capacity, and the number of concessions and plants currently being built visit CERPCH's site at: www.cerpch.unifei.edu.br.

SHP Snapshot of Brazil

According to ANEEL, new SHP projects in Brazil are as follows by year (this date includes projects both within and outside of PROINFA):

2006:

- In the first half of January 2006, two new projects started up operations, with a combined capacity of 14 MW.

During 2005:

- 14 plants started up commercial operations, with a total combined capacity of 130MW.
- 16 projects started up construction, with 322 MW.
- 18 projects were approved by ANEEL, with a total combined capacity of 244 MW.
- 44 projects had their schedules postponed, 860 MW.
- 11 projects received their environmental licenses (but were not still fully authorized),144 MW.
- 40 projects transferred ownership, with 767 MW.

During 2004:

- 7 plants started up commercial operations, with a combined capacity of 68 MW.
- 11 projects started up construction, with 86 MW.
- 50 projects were approved by ANEEL, with a combined capacity of 615 MW.
- **20** projects had their schedule postponed, with 330 MW.
- 32 projects received their environmental license (but were still not fully authorized), with 510 MW.
- 18 projects transferred ownership, with 315 MW.

During 2003:

- 22 plants started up commercial operations, with a combined capacity of 268MW.
- 8 projects started up construction, with 90 MW.
- 27 projects were approved by ANEEL, with a combined capacity of 410 MW.
- 19 projects had their schedule postponed, with 370 MW.
- 52 projects received their environmental license (but were not still fully authorized), with 754 MW.
- 8 projects transferred ownership, with 135 MW.

During 2002:

- 12 projects started up operations, with a combined capacity of 52 MW.

During 2001:

- 15 projects started up operations, with 69 MW.

A complete and updated list of these projects, including the status and name of project owners, by project, can be viewed at ANEEL's website in Portuguese only:

www.aneel.gov.br/fiscalizacao.

Main Players

The main players in this market in Brazil are:

ANEEL
ANEEL, the National Agency for Electric Energy. ANEEL is the regulatory authority for the sector. It has power to grant concessions and authorizations for the construction and operation of power plants and for supplying electricity to the national grid. It is charged with promoting and regulating competition in this sector. Its website is www.aneel,org.br.

Brascan
Brascan Energética, controlled by Canada's Brascan Power. The company has 12 SHP plants in operation in Brazil, with a combined capacity of 205 MW. All of them are in consortia with local partners, such as construction companies, service providers and groups of investors. It announced that it plans to invest US$500 million in Brazil to achieve 500 MW by 2008, owning the majority stake in all projects that it participates in. It sells to power distributors and large consumers. In January 2006, Brascan bought additional minority stakes from Calçados Azaléia (a shoe manufacturer) in five SHP plants. Its website is www.brascanbrasil.com.br .

Cataguazes-Leopoldina
Cataguazes-Leopoldina ("Cat-Leo") is a large generation and distribution group with operations in five Brazilian states. It owned eight SHP plants, but sold them to Brascan in late 2004. Under this sales agreement, Brascan sells Cat-Leo the energy of these very same plants for distribution under power purchasing agreements averaging more than 20 years. The Cat-Leo Group has a subsidiary that works as a subcontractor, offering a variety of services, including engineering and management services for SHP plants and turn-key construction. Its website is www.cataguazes.com.br.

Camargo Correa
The Camargo Correa Group is one of the leading civil construction companies in Brazil, and it is very involved in the construction of SHP plants, as well as large hydro and thermal plants. Camargo Correa offers complete packages for SHP plants, including engineering, procurement and construction at a fixed price. Its website is www.camargocorrea.com.br.

Other leading contractors in this sector are LEME Engenharia (part of the Tractebel Engineering / Suez Group), www.leme.com.br, and PROMON Engenharia, one of the largest civil contractors in Brazil, www.promon.com.br.

CEMIG
CEMIG, the power utility of the state of Minas Gerais, has 30 SHP plants in operation with 145 MW, and an additional 31 concessions to build new plants. It recently launched a special program ("Minas PCH") aimed at the development of SHP, which calls for the installation of 400 MW within two years. CEMIG estimates the total potential of the state of Minas Gerais for new plants to be 252 SHP's with total production of 2,800 MW. Under the Minas PCH Program, CEMIG's projected investment is $400 million for the construction of 400 MW in capacity. Cemig is inviting private investors to participate in this program with equity capital. It will participate with its own capital (up to 49% of each plant), and will be responsible for commercialization and distribution of this energy to industrial consumers. Its website is www.cemig.com.br.

CELESC
CELESC, the power utility of the state of Santa Catarina (state-owned) has 12 SHP plants, with 80 MW. It also plans to develop additional SHP power. Its website is www.celesc.com.br.

CELG
CELG, the power utility of the state of Goiás (state-owned), signed PPA's with owners of five SHP plants totaling 191 MW, to build and start up the plants before end of 2008. Its website is www.celg.com.br.

Some of the large industrial users in Brazil have also invested in SHP plants in order to guarantee supply at a fixed cost. These companies include:

- Novelis (formerly Alcan) has 8 SHP plants in operation supplying 14% of its factories' consumption of 1,850 GWh/year. It plans to expand its investments in generation, especially with SHP.
- Alcoa has also invested in one SHP plant.
- CBA, a large local manufacturer of aluminum products, has invested in one SHP plant of 28.4 MW.
- Vicunha Textil, the largest Brazilian manufacturer of fabrics also works as an independent power producer with a 8.8 MW SHP plant.

CERPCH
CERPCH, the National Reference Center for Energy from Small Hydro Plants identifies and develops projects, preparing all financial and technical support for project owners and investors. It can provide investment analysis, technical feasibility studies, consulting, research and training. It is based in the Federal University of Engineering of Itajubá. Its website is www.cerpch.unifei.edu.br.

CndPCH
CndPCH, the National Center for the Development of SHP's is a private organization that operates in a manner similar to that of CERPCH. Its website is www.cndpch.com.br.

CDBD
CDBD, the Brazilian Dam Committee, is an association of engineering companies and contractors involved in construction of dams. It will be holding its fifth seminar on small and medium hydroelectric plants in Florianopolis, from April 3 to 6, 2006. This is a good opportunity for U.S. companies to meet potential Brazilian partners. The organization's website is www.cdbd.org.br.

APMPE
APMPE, Association of the Small and Medium-Sized Electric Power Producers. Its website is www.apmpe.com.br.

BNDES
BNDES, National Bank for Economic and Social Development, the only source of financing at rates below commercial banks. It is an important tool of the federal government to promote and develop industrial projects. Its website is www.bndes.gov.br

ABIMAQ
ABIMAQ, is the Brazilian Association of Machinery Manufacturers. It has a large databank of Brazilian suppliers of all kinds of equipment, which can be accessed online. Its website is www.abimaq.org.br.

ABEER
ABEER, the Brazilian Trade Association for Renewable Energy And Energy Efficiency, is an association of local suppliers of equipment and services for all kinds of renewable energy projects (including solar, wind, biomass and SHP). Its website is www.abeer.org.br.

Brazilian manufacturers can produce almost all components for the various types of SHP plants. The local subsidiaries of General Electric, ABB, Alstom, Voith Siemens and VA Tech Hydro can supply turn-key plants with very little imported contents, normally under 5% of the total value. They even export from their Brazilian factories to many other countries. In addition, there are many Brazilian companies that specialize in manufacturing components for all kinds of equipment, using 100% Brazilian technology.

Other Resources

For more information about export opportunities in this sector contact US Commercial Service Industry Specialist Maurico Vasconcelos at: mauricio.vasconcelos@mail.doc.gov

To the best of our knowledge, the information contained in this report is accurate as of the date published. However, The US Department of Commerce does not take responsibility for actions readers may take based on the information contained herein. Readers should always conduct their own due diligence before entering into business ventures or other commercial arrangements. This report was written by Senior Trade Specialist Mauricio Vasconcelos, CS Belo Horizonte.

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