

Electrical Power and Renewable Energy Industries

Overview

| (in US\$ million) | 2010 | 2011 (estimated) | 2012 (estimated) |
|------------------------|----------|------------------|------------------|
| Total Market Size | \$ 5,828 | \$ 7,348 | \$ 8,814 |
| Total Local Production | \$ 6,050 | \$ 7,200 | \$ 8,424 |
| Total Exports | \$ 740 | \$ 650 | \$ 540 |
| Total Imports | \$ 518 | \$ 798 | \$ 930 |
| Imports from the U.S. | \$ 66 | \$ 120 | \$ 140 |

Exchange rate: R\$1.77 to US\$1.00

The estimated 2012 market for Brazil's power generation, transmission, and distribution (GTD) equipment market is projected to be around US\$8.8 billion (**) of which US\$930 million is projected to be imported with about US\$140 million of that total forecasted to be from U.S. sources. In 2011, GTD-related imports increased 54%, when compared to 2010. The Brazilian Electrical and Electronics Industry Association (ABINEE) projects a 17% growth in the GTD local production figures in 2012 in comparison with 2011 as a result of the continuation of the federal government's "Light for All" rural electrification program and expected equipment orders following the recent power generation and transmission auctions.

** Note: These market estimates do not include GTD services (operational and maintenance expenses), which would add at least another 40% to the value of the market. As a result, the market sizes in this table are likely to be underestimated. Additionally, the figures noted in the table above are partially based on ABINEE's statistics. Other power-related trade associations do not release their local industry production figures. Likewise, the power associations do not publish their members' consolidated equipment imports.

Brazil is the 10th largest generator of electrical power in the world. Brazil's electricity generation is largely in the hands of the federal and state governments. The federally-owned power company, Eletrobras, controls over 36 percent of Brazil's installed generation capacity, while other energy companies, owned by various state governments, control approximately 26 percent of generating capacity. The remaining 38 percent of capacity is in the hands of private companies.

According to statistics released in January 2012 by Brazil's National Electric Energy Agency, (ANEEL), Brazil has 2,544 operational power projects with 116,884 megawatts (MW) or 116,884,000 kW of installed capacity (excluding imports). Hydroelectricity, including imports, accounts for about 72% of the total electrical power supplied in the country, as shown in the table below:

| Operating Units as of January 2012 | | | | | | | |
|------------------------------------|-------------------|--------------------|---------|-------|---------------|---------|------|
| Type | | Installed Capacity | | | Total | | % |
| | | Qty of Plants | (MW) | % | Qty of Plants | (MW) | |
| Hydro | | 966 | 82,319 | 65.85 | 966 | 82,319 | 65.9 |
| Gas | Natural | 102 | 11,424 | 9.14 | 140 | 13,213 | 10.6 |
| | Processed | 38 | 1,789 | 1.43 | | | |
| Oil | Fuel oil | 890 | 3,852 | 3.08 | 922 | 6,984 | 5.6 |
| | Residual oil | 32 | 3,132 | 2.51 | | | |
| Biomass | Sugar cane biogas | 345 | 7,194 | 5.75 | 424 | 8,917 | 7.1 |
| | Black liquor | 14 | 1,245 | 1 | | | |
| | Wood | 42 | 374 | 0.30 | | | |
| | Biogas | 15 | 71 | 0.06 | | | |
| | Rice Rind | 8 | 33 | 0.03 | | | |
| Nuclear | | 2 | 2,007 | 1.61 | 2 | 2,007 | 1.6 |
| Mineral Coal | Mineral Coal | 10 | 1,944 | 1.56 | 10 | 1,944 | 1.6 |
| Wind | | 72 | 1,451 | 1.16 | 72 | 1,451 | 1.2 |
| Imports by Brazil from: | Paraguay | | 5,650 | 5.46 | | 8,170 | 6.5 |
| | Argentina | | 2,250 | 2.17 | | | |
| | Venezuela | | 200 | 0.19 | | | |
| | Uruguay | | 70 | 0.07 | | | |
| Total | | 2,536 | 125,005 | 100 | 2,536 | 125,005 | 100 |

Source: ANEEL (National Electric Energy Agency, Brazil's power regulator)

According to national government's Power Expansion Plan (PEP) for 2011-2012, published by Brazil's Power Energy Research Company (EPE), the government is forecasting the percentage of capacity supplied by hydroelectricity to be reduced from 72.4% (the combined numbers of domestically-produced and imported from neighboring countries) to 67%, while increasing the percentage of power produced by natural gas to 15%, as a direct result of the recent large oil and gas finds in Brazil. Other renewable energy sources such as small hydro, wind and biomass plants are forecasted to increase to 16% of the country's energy supply by 2020.

Assuming an annual GDP growth rate of 4.7 percent through 2020, Brazil's electricity consumption is projected to increase from 479,000 GWh (2011) to 730,000 GWh (2020), while the country's installed capacity is expected to reach 171,138 MW (or 171 GW) in 2020. To meet this future demand for power, EPE's 2011-2020 PEP calls for investments of R\$190 billion (approximately US\$105 billion), to bring an additional 62,000 MW of power generation capacity into Brazil's power grid. About 143 power plants are currently under construction (13 hydro; 35 wind power; 50 small hydro; 44 thermal; one nuclear). ANEEL has also authorized an additional 519 power plants, on which construction has not yet begun.

In 2012, Eletrobras plans to invest R\$13 billion (US\$7.3 billion), up 44% from the R\$9 billion (US\$5.1 billion) invested in 2011. Eletrobras will invest R\$6.8 billion (US\$3.8 billion) in power

generation, R\$3.87 billion (US\$ 2.1 billion) in power transmission, and R\$1.86 billion (US\$1.0 billion) in power distribution.

Renewable Energy

Wind. According to ANEEL, total wind power capacity in Brazil rose from 602 MW in 2009 to 1,450 MW by the beginning of January 2012. By 2020, EPE projects that wind power will reach 6.7% (11.532 MW) of Brazil's power generation capacity.

In 2011 power generation auctions organized by the federal government, wind power was a major attraction, as its average cost (BRL \$99.58 per MW) was offered at a lower rate than hydro, natural gas, or other thermal power plants (e.g. coal and biomass). EPE noted that the cost per MW that was achieved marks a significant drop in price and increases the viability of wind power as an energy source in Brazil. In 1994, when the renewable energy program Proinfa was launched, prices per megawatt of wind power were above BRL \$300 per MW while in 2009 prices had fallen to BRL \$164.

Solar. Solar energy through photovoltaic technology (PV) is a competitive alternative to grid extension, but has been limited to remote areas of the country and to applications that promote social interests such as electricity supply to schools, hospitals, water pumping systems, and other uses (e.g. telecommunications). The technology is still considered costly, and the required maintenance is sometimes complex.

However, the scenario for solar energy has been changing lately, due to the operation of the first grid-tied solar project by MPX Energia (1 MW) and recent applications of solar energy at soccer stadiums and other facilities that have been built or are being renovated for the 2014 World Cup. Additionally, the launch of the Solar/PV Power Declaration in August 2011, with proposals to foster distributed energy and utility-scale solar photovoltaic power projects, has triggered significant discussions around solar energy in Brazil. Most Brazilian states already exempt solar/PV and wind power equipment from VAT tax.

Additionally, in 2008 the state of Rio de Janeiro implemented Decree Number 41318, which calls for renewable energy generation or energy efficiency projects whenever a thermal (fossil fuel) power plant is installed in the state.

In August 2011, ANEEL launched a strategic PV research and development program ("Chamada 13"), aimed at reducing PV costs, inserting PV into the Brazilian energy matrix, increasing technical capacity, and further developing the domestic PV supply chain. Power utilities presented about 20 projects under this program. These projects will enable ANEEL to design a PV regulatory framework and propose fiscal incentives to make PV more economically viable. As a result, EPE may propose specific solar power auctions in the future. A recent solar energy market report can be viewed by logging into our market research library at <http://export.gov/mrktresearch/index.asp>

Brazil has over 150 manufacturers of solar water heaters producing energy for residences as well as hotels, hospitals and swimming pools. The overall construction trend in Brazil and specific government-funded low income housing projects should help grow this market segment over the next few years.

Power Transmission

Between 2011 and 2020, the power transmission subsector will require investments of R\$46.4 billion (approximately US\$26 billion), of which R\$30 billion (approximately US\$17 billion) will be dedicated to transmission lines and R\$16.4 billion (approximately US\$9 billion) for new substations. During this period, the amount of power transmission lines (PTL) is forecasted to grow from 100,000 km to 142,000 km.

The construction of the world's largest high-voltage, direct-current PTL to connect the Madeira River hydro power plants to the southeastern states of Brazil will consist of a 2,300 km-long power line. The project will include construction of 5,000 transmission towers and will require 20,000 km of cables, 433,000 insulators, and many other types of equipment.

The ANEEL link below shows the results of the power transmission lines (PTL) that were auctioned from 1999 to 2011:

http://www.ANEEL.gov.br/arquivos/PDF/SCT_RESULTADO_LEILÃO_INTERNET_06jan2012.pdf

For a listing of additional PTLs that will be auctioned off by ANEEL in 2012, visit:

<http://www.ANEEL.gov.br/area.cfm?idArea=57>

Market Challenges

Import duties, specific local content requirements for selected types of equipment, and the public procurement legislation for government-owned power companies can be considered market challenges. Additionally, as with other industry sectors, the government is considering adopting local content requirements as part of future power auctions in the solar energy sector. Specifically in the power distribution segment, possible revisions to methodologies to calculate electrical power distribution tariffs may adversely affect the utilities' ability to make future investments.

In the generation, transmission, and distribution (GTD) sector as a whole, it is yet to be determined if the power concessions that will expire in 2015 will be automatically renewed. The Brazilian Ministry of Mines and Energy is evaluating the pros and cons of rebidding these concessions, as rebidding could result in higher prices for consumers.

Sub-Sector Best Prospects

In the power generation subsector, best sales prospect opportunities include the supply of control and supervision equipment, rectifiers, converters, inverters, heat recovery steam generators and condensers, power generation sets, heat exchangers, gas and steam turbines

and parts, and wind power turbines above 1.5 MW. Solar energy related equipment can also offer longer-term opportunities in Brazil, including liquid pumps for photovoltaic generation, air cooling systems, photovoltaic panels, solar inverters and batteries, as well as all related parts.

Best equipment sales prospects for the power transmission subsector include compact substations, SF6 - gas insulation transformers, glass and polymer insulators for 600 kV bipolar DC transmission lines, electrical switches to open circuits, circuit breakers, capacitor banks, relays, and electrical protection panels.

Additionally, U.S. power generation and transmission operators with a legal presence in Brazil may participate in future power auctions that will be held in 2012 and the following years.

The power distribution subsector offers equipment sales potential for monitoring systems to upgrade underground vaults, switches (15 kV tension capacity; 125 Bil, with open, closed and grounded positions), power transformers (500 kVA), lightning arresters, ground and surge protection systems, relays, insulated electric conductors, surge suppressors, and innovative technologies to reduce technical and commercial losses, including smart grid technologies.

Industry sources predict that Brazil will need to invest about US\$16 billion to implement a smart grid network to increase Brazil's interconnected power grid's efficiency and reliability (e.g. to reduce power black-outs).

Estimates by the Acende Brasil Institute show that Brazilians pay a total of R\$120 billion a year (approximately US\$68 billion) for their electrical power. As about 47% of this amount is made up of federal, state, and municipal taxes, it is estimated that the power distribution subsector's gross revenues amount to approximately US\$32 billion per year.

Opportunities

Although there are no official statistics showing planned investments by the power distribution subsector, the "Light for All" rural electrification program launched in 2004 is one of this subsector's most important programs. Total investment under this program thus far is estimated at R\$19 billion (approximately US\$7.6 billion). By October 2011 more than 2.8 million homes had been connected to Brazil's power grid, reaching a total of 14.3 million Brazilian citizens previously living without electricity in rural areas throughout Brazil. From 2011 to 2014, the program is expected to connect an additional 495,000 Brazilian homes to electric power, with an additional investment of approximately R\$5.5 billion.

Electrical power distributors will continue to invest in power distribution system upgrades and more efficient operational and management systems to make their companies more competitive and to meet more stringent regulations concerning client satisfaction and client servicing. Companies will also be required to invest 0.5 percent of their annual net revenues in energy efficiency and R&D programs.

Market Entry

In addition to approaching the power utilities, U.S. suppliers of GTD equipment and services are encouraged to establish contacts with main equipment suppliers, as well as engineering and

civil contractor companies for sub-contract/turnkey opportunities. Public-private partnerships (PPPs) are expected to be the best means of market access for new-to-market U.S. companies interested in future power transmission and power generation auctions. To establish a presence and to be competitive in Brazil, CS Brazil recommends also partnering with qualified Brazilian firms to participate in these PPPs.

Key Suppliers

The participation of foreign equipment suppliers has increased over the past year and is projected to remain steady over the next years if the Brazilian Real currency remains strong in relationship to the U.S. dollar. ABINEE reports that the local industry is concerned because foreign suppliers have been actively supplying equipment and services for important projects, such as the Rio Madeira power generation plant and the Tucuruí-Manaus transmission line. On the other hand, the strongest competition for US suppliers of GTD equipment originates from locally established large multinationals (e.g. ABB, Siemens, Areva, Toshiba, etc.). A list of domestically established GTD suppliers is available at <http://www.abinee.org.br/ing/>

Web Resources

- Brazilian Electrical and Electronics Industry Association (ABINEE): www.abinee.org.br
- Eletrobras: www.eletrabras.com.br
- EPE (Empresa de Pesquisas Energéticas): www.epe.gov.br/leiloes/Paginas/default.aspx?CategorialD=21
- Ministry of Mines and Energy (MME): www.mme.gov.br
- National Electrical Energy Agency: www.ANEEL.gov.br

- For more information about export opportunities in this sector, please contact US Commercial Service Industry Specialist Igly.Serafim@trade.gov