Can natural gas make power supply reliable?

Power interruptions make it clear that something is needed to plug the holes in Brazil’s energy matrix. Can natural gas do the job?

Solange Monteiro

BRAZILIANS STARTED the year paying more for less electricity. Interruptions in electric power have become depressingly routine in São Paulo city and elsewhere. Due to the power failure that struck 11 states and the capital, Brasilia, on January 19, the country again does not have enough electricity to support domestic demand, which rose 3.5% in 2014—far above GDP growth. The prolonged drought has reduced water reservoirs to a historic low, cutting hydropower supply to the point that even household faucets dried up in São Paulo.
One possible long-term solution for the recurring drains on energy may be natural gas. In recent years, the trends have been contradictory: while new hydroelectric plants have relatively small reservoirs and are thus much more dependent on rainfall, thermal power plants have multiplied, consuming more natural gas. However, thermal power plants supply only peak load, not base load, electricity, which makes contracts for gas supply more expensive. “The use of thermal as emergency power does not encourage investors to look into gas as an alternative for producing electric power,” says Marcos Tavares, managing partner of consultant Gas Energy.

Demand for electric power could well become a major stimulus for the expansion of the gas market, using gas reserves related to deep sea oil. Ernst & Young has pointed out that, with the help of deep sea gas, Brazilian natural gas production could double by 2020. When it peaks in 2024, the Libra block alone will produce 40 million cubic meters a day. This volume is comparable to what all blocks together produce today (about 47 million cubic meters a day). However, experts warn of many uncertainties about when and how much of this potential can be realized. If successful, the country would follow the global trend of gas taking a larger role in energy consumption. The global share today is about 22%, compared to 12% in Brazil, stimulated mainly by exploration of shale gas in the US, new discoveries in Australia, and heightened production in Africa and Asia.

“The use of thermal as emergency power does not encourage investors to look into gas as an alternative for producing electric power.”

Marcos Tavares

For this to happen in Brazil, however, it will not be enough to ensure production of deep sea gas. Among barriers on the road to a strong gas market are current regulations, a lack of incentives to attract new investors, and complications that prevent competitive pricing of gas for consumers.
Edmar Almeida, coordinator of the Energy Economics Group (GEE) of the Federal University of Rio de Janeiro, points out that lack of a comprehensive policy for natural gas owes much to the fact that most gas production is associated with the oil in offshore drilling. “In this case gas has been regarded as a byproduct—more a problem than a marketable product,” he says. “Today Brazilian gas production adds up to only about 20% of oil production, in terms of equivalent barrels. It is the smallest amount among all oil-producing countries.”

Both supply and demand for gas have been irregular. Even though the share of gas in Brazil’s energy mix tripled from 4% to 12% between 1999 and 2014, GEE’s Marcelo Colomer points out that this happened despite frequent changes in public goals. “Initially, policy focused on supplying gas to industry. Then in 2004 it changed to giving priority to the construction of thermal electric power plants to reduce the risks related to hydropower plants. In 2004, with the prospect of reduced consumption of thermal power, state oil company Petrobras launched a program to stimulate industrial, residential, and automotive consumption of gas,” he says. Gas consumption did increase, but since 2007 so did thermal power and changes in gas contracts with Bolivia resulted in large gas imports and higher prices. “At that time, there was frustration among industrialists—they had converted production to gas expecting an abundant and cheap gas supply that would

### Brazil's consumption of natural gas
(Millions of cubic meters per day)

<table>
<thead>
<tr>
<th></th>
<th>2014</th>
<th>2018</th>
<th>2023</th>
</tr>
</thead>
<tbody>
<tr>
<td>Electric power</td>
<td>26.2</td>
<td>15.7</td>
<td>23.4</td>
</tr>
<tr>
<td>Cogeneration(^1)</td>
<td>2.7</td>
<td>3.2</td>
<td>4.1</td>
</tr>
<tr>
<td>Raw material(^2)</td>
<td>7.6</td>
<td>15.3</td>
<td>17.5</td>
</tr>
<tr>
<td>Energy sector(^3)</td>
<td>9.1</td>
<td>15.6</td>
<td>18.1</td>
</tr>
<tr>
<td>Residential</td>
<td>1.1</td>
<td>1.6</td>
<td>2.2</td>
</tr>
<tr>
<td>Commercial, public sector, and agribusiness</td>
<td>0.8</td>
<td>1.1</td>
<td>1.4</td>
</tr>
<tr>
<td>Transport</td>
<td>5.5</td>
<td>5.9</td>
<td>6.7</td>
</tr>
<tr>
<td>Industry</td>
<td>32.2</td>
<td>43.6</td>
<td>54.3</td>
</tr>
<tr>
<td>Additional electric power</td>
<td>30.2</td>
<td>45</td>
<td>69.4</td>
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</tbody>
</table>

\(^1\) Industry and commerce.  
\(^2\) Input in refineries, fertilizer plants and industries.  
\(^3\) Oil refineries’ consumption.
improve their competitiveness,” said Cristiano Prado, manager of Industrial Competitiveness and Investment of the Federation of Industries of Rio de Janeiro.

Lucien Belmonte, superintendent of the Brazilian Association of the Glass Industry, says that conversion to gas in that industry was 100%.”The most striking case was the factory that the Japanese AGC built. Between the time of the announcement of the factory construction, in 2011 and the start of operations in 2013, the gas price increased by 42%. In that kind of situation how can anyone make a business plan?” he asks. The result? More imports of glass products, Belmonte says—”perfume bottles from Mexico, enamel glasses from India, and car windshields from China.” He points out that “At the time, the gas price was US$8 per million of BTUs; today it is US$15; and we also have competition from US shale gas at US$4.”

With the help of deep sea oil,
Brazilian natural gas production could double by 2020. When it peaks in 2024, the Libra block alone will produce 40 million cubic meters a day.

Petrobras,” Tavares says. He recalls that the Gas Law of 2009 was intended to decentralize the gas sector, but it needs supporting regulation before it can really go into effect. Major improvement has occurred in gas transport since a 2014 regulation prohibited companies controlled by the same group to own both the gas and the pipeline. But gas transport will change only gradually because concession agreements for Petrobras pipelines will not expire until 2018.

**Vertical concentration**

Among analysts and players in the gas market, there is a consensus on the need to attune gas market regulations to electric power needs; review the pricing policy that makes Brazilian gas expensive; and take a hard look at gas production, which today is vertically concentrated in state oil company Petrobras. The company is responsible for 81% of gas production, owns virtually all marketing operations and transportation pipelines, and has shares in several distributors. "We cannot operate in the gas supply chain without having to go through
“Today Brazilian gas production adds up to only about 20% of oil production, in terms of equivalent barrels. It is the smallest amount among all oil-producing countries.”

Edmar Almeida

To date, major advances have come about only through high-stakes projects. In the last energy auction late in 2014, for example, Bolognesi Energy acquired two gas-fired thermal power plants, in Rio Grande do Sul state and Pernambuco state, each with a capacity of 1.2 GW and with investments in two liquid natural gas (LNG) terminals and a 311 km pipeline that would connect the gas terminal port of Rio Grande to the Triunfo petrochemical complex. Another project under study, eagerly awaited by the market, is Route 4, a private pipeline (the first) that would take deep sea gas into the Santos Basin and distribute it in the São Paulo metropolitan area. The main project proponent is Cosan, a shareholder of Comgás gas distributor. “Our estimate is that this pipeline will carry about 20 million cubic meters a day, more than the total consumption of São Paulo state in 2014, which was 17.2 million,” says João Carlos de Souza Meirelles, São Paulo state energy secretary. Today São Paulo state consumes more than a third of all natural gas sold in the country. With only two gas-fired power plants in Cubatão and Piratininga, Meirelles says, São Paulo is supporting industrial consumption and cogeneration, especially for projects in malls and corporate buildings, and more residents are using gas for water heating.

Ieda Gomes, consultant to FGV Energy, underlines the importance of expanding the supply of gas: “Brazil is increasingly dependent on imported LNG, which has low prices now but at times has cost 50% more than Brazil’s own gas and gas imported from Bolivia.” Currently, about half the gas consumed in the country is imported.

Potential gross production of natural gas in the deep-sea oil fields

(Millions of cubic meters per day)

She also points out that the future of the gas supply from Bolivia is uncertain; the contract will be renegotiated in 2019. Investment in gas exploration in Brazil has been low, and Bolivia’s gas reserves have fallen by at least half since 1999. “To stimulate national gas production,” she says, “it is necessary to ensure conditions for investors to negotiate securely and have a tax system that is compatible with the difficulty and size of the project, so as to reduce market risk.”

Joísa Campanher Dutra, of the FGV Center for Regulation and Infrastructure Studies (Ceri), highlights the need to also encourage gas production on land: “Geological studies of gas reserves on land are expensive, so we have few. However, think about how Colombia has encouraged exploration. It grants the right to operate to increase information about gas reserves, in exchange for a simplified procedure for signature bonuses and sharing gas production.” She points out that investors in onshore areas can be smaller, which could attract new companies to the gas market.

**Cloudy without rain**

Prospects for efforts to carry out gas projects are grim, Petrobras is still the great locomotive of the sector, but its current investment capacity is limited. Adriano Pires, director of the Brazilian Center for Infrastructure (CBIE), believes, however, that low oil prices and the electric power crisis may offer a unique opportunity for the gas sector. “In the current situation,” he says, “I think Petrobras will have to review its investment plans and necessarily divest. In that case, it should sell assets that are not its core business,” Pires says, suggesting that Petrobras should sell its shares in gas distribution companies, pipelines, and regasification units.

In a paper commissioned by the Brazilian Association of Large Industrial Energy Consumers and Free Consumers (Embrace), Gas Energy estimated in 2013 that the Petrobras transportation assets, pipelines totaling 11,000 km, would be valued between R$12 billion and

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**Brazil’s demand for imported natural gas increases**

<table>
<thead>
<tr>
<th>Year</th>
<th>Natural gas</th>
<th>FOB US million</th>
<th>% change</th>
<th>Liquefied natural gas (LNG)</th>
<th>FOB US million</th>
<th>% change</th>
</tr>
</thead>
<tbody>
<tr>
<td>2012</td>
<td>3,336</td>
<td>-</td>
<td></td>
<td>1,548</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>2013</td>
<td>3,990</td>
<td>16</td>
<td></td>
<td>2,835</td>
<td>83</td>
<td></td>
</tr>
<tr>
<td>2014</td>
<td>3,827</td>
<td>-4</td>
<td></td>
<td>3,139</td>
<td>11</td>
<td></td>
</tr>
</tbody>
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**Gas consumed by Brazilians**

- **48%** are supplied domestically
- **33%** are imported from Bolivia
- **19%** are imports of LNG

*Usage: 98 millions of cubic meters per day*

Source: Ministry of Mining and Energy.
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R$20 billion. Taveres believes that selling those assets to finance investments in deep sea oil would be an efficient use of Petrobras resources.

Heron Miguens, executive director of the Ernst & Young Center for Energy and Natural Resources (EY), observes that what the history of other countries teaches is that opening markets and reducing concentration brought investment and increased demand, which can be an opportunity to develop a more balanced gas market.

CBIE’s Pires also points out that low international oil prices, which guide the price of LNG, can be an ally in this time of transition, allowing gas to be imported in the short term while tidying up the house. To expand imports of LNG, he argues for Petrobras to divest its gasification assets, which today have idle capacity, and its transport facilities. Miguens believes low international gas prices will also promote use of gas by industry. He also argues for reviewing what he calls the “tax cascade” on gas. He points out that each step of the gas supply chain pays value-added tax, adding to the cost to the consumer.

Lavinia Hollanda, FGV Energy research coordinator, points out that in the next five years the outlook for gas will change little, “which does not reduce the importance of planning the coming decades,” she says. “Today the gas market is almost a blank page,” Pires adds. “There’s work for everyone to do: state regulators, market players. If everyone does their share, in the end the result will be a country where gas has a more important role than it has now. It will be the era of natural gas. Gas may be a fossil fuel, but it is the cleanest fossil fuel. Brazil cannot remain on the sidelines of this transformation.”

International prices of natural gas
(US dollars per million BTU)

Source: FGV Enerov and EIU, June 2014.