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ISSN : 1875-418X
Issue : Vol. 18 - issue 3
Published : May 2020

This paper is part of the OGEL Special Issue on "*Changing LNG Markets and Contracts*" edited by:



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Fate and Reform Catalyze Expansion of the Brazilian Natural Gas Market and Open Up Opportunities to LNG by L. Diaz

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Fate and Reform Catalyze Expansion of the Brazilian Natural Gas Market and Open Up Opportunities to LNG

Liliana Diaz¹

Abstract

Brazil is rising as a potentially large natural gas player thanks to both fate and reform. Recent “closer to shore” significant deep-water discoveries add to well-publicized offshore potential in the pre-salt area. These less logistically challenging discoveries coupled with Petrobras’ increasing retrenchment along the value chain, herald the arrival of a vibrant and competitive domestic market. Increased associated offshore production will even hold the promise of opening the export market. While liberalization is still a work in progress, recent efforts to overhaul the market design and enhance competition have paved the way for further market expansion. This article details what those efforts are and why they gained momentum. The development of domestic demand beyond coastal states and in foundational sectors such as power generation, where LNG imports are to play a key role in the short to medium term, are essential for Brazil to fulfill its natural gas potential.

Introduction

“God is Brazilian” is a common saying in Brazil that fuels the patriotic belief that the country is destined for greatness. Though the country has had its fair share of troubles over the past few years, it is hard not to consider that fate is indeed playing a role in the natural gas sector.

In June 2019, state-controlled energy company Petróleo Brasileiro S.A. (Petrobras) announced six significant deep-water natural gas discoveries in the Northeast offshore Sergipe basin. This is the largest discovery announced in Brazil since the 2006-2008 pre-salt² finds. When developed, the Sergipe fields are expected to produce 20 million cubic meters per day (Mm³/d) of natural gas, equivalent to one third of total Brazilian production.³ Given the fields’ proximity to shore and planned increases in processing and transport capacity, the expectation is that this production will reach the market at competitive prices, making natural gas more affordable.⁴

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² The term pre-salt is commonly used to designate geologic layers that formed before salt layer accumulated above it. It is located in ultra-deep waters, between 1,900 and 2,400 meters. Because the salt layer can exceed 2,000-meter-thick in some areas, and water depth can reach over 2,000 meters, a pre-salt deposit can be located over 7,000 meters depth. Industry analysts have reported the pre-salt oil and gas potential to be mostly located in the Northeast to South of Brazil, in the Gulf of Mexico and in Africa's West coast. Prospection for oil in the pre-salt layer gained momentum as easy oil deposits located in the above layers started to run out. In 2007, exploration in the pre-salt layer in the Brazilian continental shelf resulted in the discovery of a new oil and gas province with significant hydrocarbons potential.

³ “Petrobras confirms natural gas find in Sergipe Basin”, Reuters, June 17, 2019.

⁴ “Petrobras faz a maior descoberta desde o pré-sal, em Sergipe e Alagoas,” Revista Época Negócios, 16 June 2019. Petrobras’ Business and Management Plan 2019-2023 outlines investments to facilitate offloading and processing capacity and there are nearby natural gas processing units in the Sergipe (Atalaia NGPU and Alagoas (Pilar NGPU) states.

But fate may not be enough to propel the monetization of Brazil's natural gas reserves.⁵ Relative to its resource base, the Brazilian natural gas market is small and concentrated, controlled by an incumbent present along each segment of the value chain. Regulatory reform and specifically, effective liberalization, are seen as a requirement for further development. Efforts to overhaul the market design and enhance competition have been afoot since 2016. This article will detail what those efforts have entailed and why they gained momentum. The convergence of fate and reform will bring about a once in a lifetime opportunity for private investment across the Brazilian natural gas value chain.

In order to understand the drivers of change and the obstacles to further market development, this article provides:

- A brief background of the sector and the role played by national champion Petrobras in its development;
- An overview of past and current regulatory developments; and
- A brief analysis of the state of the market.

A National Champion Overstaying Its Welcome

An understanding of the current status of the Brazilian natural gas sector must begin with appreciating the role of Petrobras. In contrast to other markets in the region, the emergence of the state monopoly and national oil company in the early 1950s was not preceded by great resource wealth. Petrobras, in particular, was entrusted with ensuring the supply of oil and refined products on which the country was highly dependent. Over the years, it developed world-class capabilities, particularly in offshore exploration and development, with enviable results. During this time, however, Petrobras was also tasked with uneconomical endeavors dictated by national necessity rather than corporate profit. In the early 1990s for example, when natural gas demand stood at 2%, its presence along the value chain (from importation from Bolivia through distribution) was fundamental to have natural gas displace fuel oil use in the country's industrial heartland. Ever since, even as the state's monopoly has been relaxed since the mid-90s, Petrobras' presence has been necessary to prop-up and develop the Brazilian natural gas market.

Petrobras' success in developing a natural gas market can partly explain the limited impact of regulatory efforts in recent years. The 2009 Gas Law was enacted to increase competition at a time when Petrobras was increasingly required to operate as a profitable endeavor responsible to all its shareholders. The perhaps unsurprising aftermath was that Petrobras was efficient in leveraging its presence along the value chain, frustrating meaningful change.

In 2015, in the wake of the multi-billion kickback corruption scandal known as Car Wash (Lava Jato) and pressed by the need to generate cash to lower its debt ratio, Petrobras announced an asset divestment process. Since mid-2014, operation Car Wash's investigations uncovered how dozens of companies acknowledged paying bribes to politicians and officials in exchange for contracts with the oil and gas national champion. The scandal together with an impairment of assets, contributed to steep losses for Petrobras of more US\$10bn in 2015.

⁵ According to the 2018 BP Statistical review, in 2018 proven reserves stood at 0.4 trillion cubic meters (tcm).

As part of the divestment, Petrobras will shed strategic assets along the natural gas value chain in order to focus on offshore exploration and development, which constitutes the core of its profitable operations. Petrobras' withdrawal from mid and downstream segments will leave behind well-integrated operations along the value chain. From a regulatory perspective, the current government hopes divestment will entice new players to enter the natural gas market and encourage competition.

Since 2016, progress has been made as a result of the divestment. Yet Petrobras continues to be the main economic actor along the value chain. Its current participation in the market is as follows:

- **Production and Processing:** Despite the end of the state monopoly in 1997, Petrobras is still responsible for 78% of production as of April 2019; a significant portion of which is offshore associated gas. Starting in 2017, the government's regulatory agency (Agência Nacional do Petróleo, Gás Natural e Biocombustíveis or ANP) has scheduled what are being touted as transformative bidding rounds that opened opportunities not only for big players in the pre-salt (cessão onerosa do pré-sal in 2019), but also for mid and small size players in mature onshore and shallow water fields near existing infrastructure, to bring them to market in the medium-term.⁶ Yet, existing gathering pipelines remain in Petrobras' hands, requiring producers to sell to Petrobras at the wellhead. Furthermore, Petrobras is responsible for 100% of imports on account of its ownership of all three of the country's LNG regasification terminals and import pipelines. Finally, Petrobras also controls nearly 100% of processing capacity.⁷
- **Transportation:** Though progress has been made to gradually deconcentrate production, transportation remains a sector difficult to reform. Brazil has over 9,000 km of pipelines encompassed by two main interconnected pipeline networks along the northern and southern coastal areas, an import pipeline from Bolivia and an isolated pipeline in the interior northwest. Tasked with ensuring supply and reliability in the past, Petrobras' dominant presence is a function of both its direct and indirect ownership of infrastructure and its position as the main shipper of natural gas. For example, Petrobras indirectly holds 51% of the 3,000+ km import pipeline from Bolivia (Transportadora Brasileira Gasoduto Bolívia-Brazil S.A. or TBG) that supplies the industrial heart of the country and has historically held ship-or-pay contracts for its full capacity.⁸ In early 2016 and in early 2019, Petrobras sold controlling stakes (90%) to the private sector in its other two large pipeline networks: Nova Transportadora do Sudeste (or NTS) and Transportadora Associada de Gás (TAG); yet in both instances, it remained contractually entitled to their capacity and effectively operates them.⁹

⁶ "Oil and Gas Opportunities in Brazil 2017 - 2019 Bidding Rounds," ANP, June 2017.

⁷ "Nota Conjunta - Comitê de Promoção da Concorrência do Mercado de Gás Natural," Ministério da Economia - Ministério de Minas e Energia, 8 July 2019.

⁸ In December 2019 ANP will auction 18Mm³/d of TBG's capacity upon the expiry of one of its existing contracts. See "Brazil postpones tender to contract Gasbol pipeline capacity," BNAméricas, 11 June 2019.

⁹ NTS is a 2,000+ km gas pipeline that runs along the southeastern Atlantic coast of Brazil including in Rio de Janeiro, São Paulo and Minas Gerais. TAG is a 4,500 km gas pipeline mainly running along the central and northern Atlantic coast of Brazil.

<https://www.pehub.com/canada/2019/06/petrobras-closes-8-7-bln-sale-of-tag-to-engie-cdpq-reuters/>

- **Distribution:** The distribution subsector remains the toughest to reform. Currently, Petrobras, through its subsidiaries Petrobras Distribuidora and Gaspetro, controls the distribution of gas in the Espírito Santo state and holds an ownership stake in 19 of the 27 gas distribution concessionaires in the country.¹⁰ These distribution companies are responsible for roughly 52% of natural gas consumption.¹¹ Since Petrobras is the largest producer and effectively the main marketer,¹² contract negotiations with state-level distribution companies are often perceived as lacking transparency.¹³ As it stands, Petrobras is also a large consumer responsible for 40% of total available supply and 45% of natural gas based electricity generation.

A Regulatory Overhaul Looks to Kick Start the “New Gas Market”

During his inaugural address in January 2019, President Bolsonaro pledged to transform the economic landscape and to open up new opportunities. In his view, state involvement through overregulation and state-owned enterprises has stifled competition, productivity and efficiency. As a result, his administration is expected to privatize a number of assets and try to address monopolistic practices. While privatization is a familiar recipe for the region, the privatization of assets in the Brazilian energy sector stands out as it will provide investors access to one of the country’s pockets of excellence.

In his campaign platform (also known as “Project Phoenix”), President Bolsonaro stated his intention to enhance competition by ending Petrobras’ de facto monopoly along the natural gas value chain. This was hardly a radical shift from existing policy. Petrobras had begun its asset divestment program in 2016. In addition, President Temer, Bolsonaro’s predecessor, had outlined a “Gas to Grow” (Gás para Crescer) program that same year, seeking to overhaul the market design and enhance competition, including measures to harmonize federal and state rules. Temer’s reform initiative was eventually derailed in Congress as a result of state resistance over the federal regulation of distribution operations.¹⁴

¹⁰ See Gaspetro. <http://www.gaspetro.com.br/pt/institucional/participacoes-acionarias-1> According to an interview with a Petrobras official, the direct participation of Petrobras in these LDCs is roughly 19 percent, which was portrayed as a minority stake. The ownership stake used to be higher, but pursuant to a sale of 49 percent of its participation in Gaspetro to Mitsui, Petrobras ownership participation was reduced. The stake was sold to Mitsui for R\$1.9 billion on December 2015.

¹¹ MME, ANP & EPE. (2016). “Gás Para Crescer - Relatório Técnico”. October 2016, p.14.

¹² The other sellers of gas are the Consortium formed by PGN (Parnaíba Gás Natural) and BPMB Parnaíba, in the Parnaíba Basin and Panergy in Bahia.

¹³ MME, ANP & EPE. (2016). “Gás Para Crescer Anexo 1 Comercialização De Gás Natural. Available online at: http://www.mme.gov.br/documents/10584/4033411/1.G%C3%A1s+para+Crescer_Comercializacao.pdf/ccdb1f37-7ccf-4929-8957-6346767008f0

¹⁴ The Temer administration settled for an administrative decree in which the ANP was empowered to continue within the confines of existing 2009 Gas Law to regulate among other things, non-discriminatory access to strategic infrastructure (e.g. LNG terminal, processing and storage facilities, and gathering pipelines) and the pipeline network in a manner that encourages a transition into a transportation system based on a capacity entry-exit model with competitive trading and pricing. See Decree n° 9.616/2018: http://www.planalto.gov.br/ccivil_03/_ato2015-2018/2018/decreto/D9616.htm

In Brazil's federal system,¹⁵ the federal government's regulatory powers end at the city gates.¹⁶ The 2009 Gas Law created regimes allowing large consumers to bypass local distribution companies to purchase (i.e. free consumer), import or produce gas, but their implementation at a state-level has floundered, with some very recent exceptions.¹⁷ States are sensitive to federal encroachment that might affect state-owned utilities (and their revenue), and their opposition has been cited as the cause of the Temer administration's inability to have its reform program approved in Congress. The Bolsonaro administration hopes fiscal incentives will help persuade state authorities to engage in self-reform.¹⁸ Updated state regulatory regimes are needed to attract investors who will step in when Petrobras exits the distribution market and will finance infrastructure to unleash demand.

Prior to Bolsonaro coming to power, the ANP had already engaged in significant technical analysis and stakeholder outreach to support reform efforts.¹⁹ Building on that work, in April 2019, the National Energy Policy Council (CNPE) established the Natural Gas Market Competition Promotion Committee that again surveyed stakeholders before putting forth its recommendations.²⁰ This work served as the basis for the CNPE's approval of guidelines for a rebranded liberalization program: the "New Gas Market," released on June 24, 2019.²¹ The guidelines unsurprisingly reiterated many of the policy objectives articulated in the past, such as increased competition, further integration with the power and industrial sectors, harmonization of state and federal regulations and removal of tax barriers.

Some of the specific measures the New Gas Market program calls for include:

- Unbundling of the value chain (production, transportation, retail and distribution), with transport agents fully independent from other agents in the chain;
- Non-discriminatory third-party access in essential infrastructure (gathering, processing and regasification);

¹⁵ Brazil is a federation of 26 fairly independent states and the Federal District of Brasília. Each state has its own elected legislature and governor. Each state can enact its own legislation as long as it does not conflict with federal legislation. There are three levels of government: federal, state and municipal.

¹⁶ Constitution, Article 25 (as amended in August 1995). Constitutional Amendment No. 9 of August 1995 provided "[t]he states shall have the power to operate, directly or by means of concession, the local services of piped gas, as provided for by law, it being forbidden to issue any provisional measure for its regulation". This limits the federal regulatory remit, exercised by ANP, to the gas distribution network's city gates, i.e. the point where the gas leaves the long-distance transportation system for the lower pressure, more diffuse, systems of local distribution companies (LDCs) who deliver the gas directly to homes or businesses. Poppe de Figueiredo Muñoz, C, et al. (2014). *Gás Natural*. Cadernos FGV Energia, Vol. 1 No 2. November 2016, p. 36.

¹⁷ Two states have in the past months enacted reforms to bring state-level regulations in line with federal objectives: Rio de Janeiro and Espírito Santo.

¹⁸ "Nota Conjunta - Comitê de Promoção da Concorrência do Mercado de Gás Natural," Ministério da Economia - Ministério de Minas e Energia, 8 July 2019. Yet even in instances in which reform has moved forward (such as in Rio de Janeiro) and on other in which it might, legal challenges might arise if reforms undermine the financial viability of pre-existing concessions or the interests of private shareholders in local distribution companies. See for e.g. <https://www.poder360.com.br/governo/quebra-de-contratos-de-distribuicao-de-gas-deve-resultar-em-guerra-judicial/>

¹⁹ Starting in October 2018, the ANP had invited the public to comment on its analyses on the unbundling of the natural gas sector as well as how to increase market competition and supply. See ANP Notice on Taking of Public Comments, N° 6 of 2018. The ANP's analyses had been published in May 2017 and June 2018.

²⁰ CNPE Resolution N° 4, 9 April 2019.

²¹ CNPE Resolution N° 16, 24 June 2019.

- Creation of three market zones (one per carrier), with carriers responsible for the network coordination, based on network codes developed by them and approved by ANP;
- Definition of Petrobras as a last resort supplier responsible for balancing operations among the three zones and interconnections between carriers during a transition period;
- Possibly executing sale auctions to reduce market concentration;
- Adoption by states of regulatory measures related to the creation of independent regulatory agencies, privatization of gas distributors, development of free consumers, self-producers and self-importers. The government's intention is to entice states to adhere to these measures in exchange for federal financial assistance through the “Mansueto Plan”²² and even from the pre-salt funds;²³
- Conclusion of agreements between states to implement a tax adjustment, which seek to amend a taxation rule to be applicable to the commercial rather than the physical flow of gas.²⁴

The effort to enhance competition did not stop with the enactment of the New Gas Market guidelines. A few weeks later, the government and Petrobras added a catalyst to the mix. On July 8, 2019, the Brazilian competition authority (Conselho Administrativo de Defesa Econômica or CADE) and Petrobras reached an agreement by which the latter has committed to provide third-party access to strategic infrastructure to increase the numbers of players in gas commercialization and to divest itself of transportation and distribution assets by 2021 as follows:²⁵

- **Third-party access:** Subject to certain exceptions, Petrobras agreed not to enter into new engagements to purchase natural gas at the wellhead in Brazil starting in July 2019. The company also agreed to lease its main LNG regasification terminal (Baía de Todos os Santos).²⁶ Finally, Petrobras agreed to, in good faith and subject to existing contractual and co-ownership arrangements, negotiate access to gathering and processing infrastructure.
- **Divestment:** Petrobras agreed to map existing gas flows on an entry and exit point basis to determine excess capacity in the NTS and TAG pipelines that can then be put to tender. The company also committed to sell its remaining 10% share both in the TAG and NTS pipelines by December 2021. It will also sell its 51% share in

²² Through the Fiscal Balance Program (PEF), the government provides for Union guaranteed loans to the states.

²³ Through the Fiscal Financial Strengthening program, the government provides funds raised from the exploitation of pre-salt to states according to a ranking that measures execution of regulatory measures to overhaul the natural gas market.

²⁴ Imposto sobre Operações relativas à Circulação de Mercadorias e Prestação de Serviços de Transporte Interestadual e Intermunicipal e de Comunicação or ICMS

²⁵ CADE-Petrobras agreement, 8 July 2019: <https://epbr.com.br/wp-content/uploads/2019/07/TCC-vers%C3%A3o-p%C3%BAblica.pdf>

²⁶ The Bahia Regasification Terminal has a regasification capacity of 14 million m³/day of natural gas. The company also operates regasification terminals at Pecém (Ceará state) and Guanabara Bay (Rio de Janeiro state) with capacities of 7 million m³/day and 20 million m³/day respectively.

TBG import pipeline by December 2021 once the tender to contract available capacity is awarded. Finally, Petrobras agreed to sell either its 51% share of Gaspetro or its individual shares in each of the 19 state-level distribution companies.

In complying with the agreement, by December 2019, Petrobras had initiated the pre-qualification bidding process for both leasing the LNG regasification terminal and disposing of its 10% ownership in the TAG pipeline; had determined that about half of the contracted transport capacity it currently holds can be offered in competitive bidding to third parties and announced it wished to dispose of its remaining 51% ownership in Gaspetro in 2020 via an initial public offering.²⁷

The combination of an incentive program that entices states to buy into the reform package and the commitment of Petrobras to reduce its presence both by divesting and assuring third-party access should affect the market transformation that previous regulatory efforts were unable to bring about fully. Indeed, room for other players has been created and the opportunity to enter a large market should entice investors. The government expects the changes may usher in R34bn (\$8.9bn) in investment in natural gas infrastructure through 2032. With increased competition, a reduction in gas prices of about 10% is also expected, which by government calculations should increase industrial GDP by 2.1%.²⁸

Bringing Gas to Shore

As depicted in Figure 1, significant portions of increased natural gas production in the past decade, mostly offshore associated gas, have not made it to the market, and have been either reinjected or flared. As Petrobras and other market agents focus their efforts on offshore oil development, how to channel associated gas production will increasingly be an issue. Assuming half of gross production is reinjected and required infrastructure build up takes place, FGV Energia has estimated that marketable natural gas production could increase from 52.8 Mm³/d in 2018 to about 135 Mm³/d by 2030 and 450 Mm³/d by 2040, a 150% and 750% increase from 2018 levels.²⁹

²⁷ “Petrobras inicia processo para arrendamento de terminal de GNL na Bahia”, in Reuters, December 9, 2019. “Petrobras prevê ofertar metade da capacidade de transporte de gás a terceiros”, in Reuters, October 29, 2019. Polito, Rodrigo. “Petrobras pretende fazer IPO da Gaspetro no 2º semestre de 2020”, in Valor, November 12, 2019

²⁸ “Brazil approves pro-market gas regulations”, Argus media, June 25, 2019

²⁹ Chambriard, Magda and Daniel Lamassa. “Reflexões sobre pré-sal e seus reflexos para o mercado de gás natural”, O novo mercado de gás natural: opiniões de especialistas, perspectivas e desafios para o Brasil”, FGV Energia, August 2019, at p. 71.

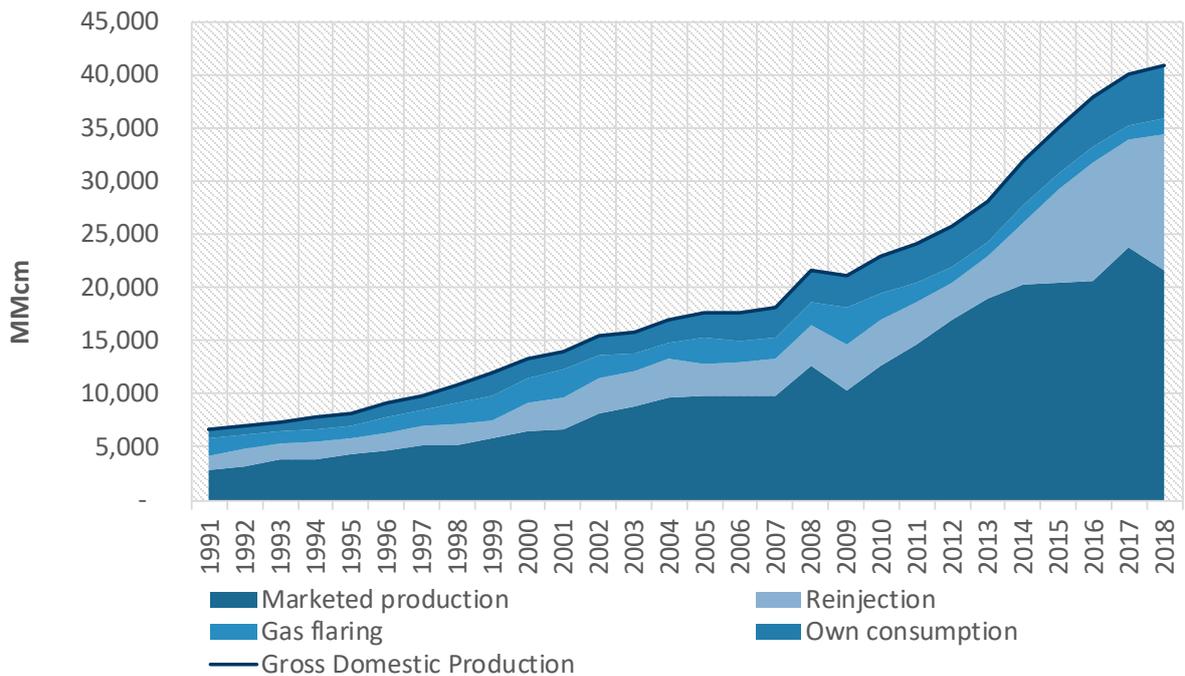


Figure 1 Brazilian natural gas production (1991-2018)³⁰

Scale and third-party access to essential infrastructure will make the difference for pre-salt gas to reach the shore in higher quantities. The amount of pre-salt natural gas that actually makes it to shore highly depends on the carbon dioxide (CO₂) content in the gas. Pre-salt gas has a high content of CO₂. To be competitive with other gas sources available in Brazil, measured as the price of the molecule, pre-salt gas could only afford to have a CO₂ content of up to about 20%. Beyond that level, the breakeven price of pre-salt gas surpasses the \$8.50/ million British thermal units (MMBtu) threshold. Therefore, processing and bringing this gas to shore becomes uneconomical.³¹ And this is where a greater number of players and infrastructure availability becomes relevant. Producers developing fields with different CO₂ content ranges, and therefore facing differentiated breakeven values, could blend these volumes for sale as a basket of processed natural gas and offer it to the market at a weighted average price, so that supply remains competitive. In addition, several nearby blocks could jointly develop the gathering and processing infrastructure necessary to attain economies of scale that could potentially enable gas with a higher CO₂ content to be produced. This works if third-party access rules are in place and enforced.

Recently Petrobras announced that it is analyzing the development of floating liquefaction facilities as an option to surmount the offshore gathering and processing infrastructure challenge pre-salt production will face in the second part of this decade. According to the Company, the project will require participation from other producers so as to comply with the mandate to reduce its ownership of essential infrastructure. Pre-salt LNG could be shipped to regasification terminals in Brazil to serve seasonal demand from the power sector or new industrial and transportation demand centers. Alternatively, pre-salt LNG could be offered to the international market.³² However, this option will depend as much on pre-salt gas

³⁰ Author with data from ANP. Available online at: <http://www.anp.gov.br/dados-estatisticos>

³¹ Empresa de Pesquisa Energética- EPE. “Informe: Custos de Gás Natural no Pré-Sal Brasileiro”. April 18, 2019.

³² Pamplona, Nicola. “Petrobras retoma estudos sobre terminal flutuante para gás do pré-sal”, in Folha, October 31, 2019.

production, processing and liquification economics, as on the available opportunity in the international market.

Much of the current and projected global gas demand comes from major Asian economies in the midst of power and gas market liberalization processes and transitioning from polluting fuels mandated by environmental concerns. The transition is possible through a variety of energy sources and technologies besides natural gas. In addition, LNG supply is expected to be plentiful in the coming years as planned liquefaction capacity comes online from several countries including the US, Australia, Mozambique, Indonesia, Malaysia, Canada, Senegal and Mauritania. About 109.2 billion cubic meters per year of capacity is already under construction and expected to be added between 2019-2023. Added to this, large gas producers, such as Qatar and Russia, have made public their desire to expand gas production and enlarge their liquefaction footprint.³³

It is unclear whether in a decade Brazilian LNG from the pre-salt could be competitive versus incumbents such as Trinidad and Tobago and the US and if there will be new entrants in this market. In this respect, Brazil lags behind its neighbor Argentina. Unconventional gas production from Argentina's Vaca Muerta has substantially increased, allowing Argentina to start selling gas to Chile on an uninterrupted basis³⁴ and LNG cargos to the spot market.³⁵ Plans to develop liquefaction capacity at a larger scale are already on the drawing board.³⁶

Igniting Domestic Demand

With domestic production expected to rise, the question becomes whether Brazil can ignite demand to absorb this production. Currently, natural gas demand is still limited to about 13% of primary energy supply and is mostly used for the industrial and power sectors; residential and commercial consumption is still comparatively small. The government's energy planning commission (Empresa de Pesquisa Energética or EPE) forecasts the industrial and power sectors will continue to drive consumption but without major changes in share distribution.³⁷ Natural gas consumption both for industrial and power generation uses is sensitive to competing fuels. As a result, further policy signals will be necessary to indicate that Brazil has a long-term vision for natural gas in the domestic market and that this fuel will play a greater role in the country's energy mix going forward.

The power sector has great potential if project developers are able to economically and reliably source natural gas. Brazil's electricity auctions of long-term energy contracts in the regulated market for new supply have increasingly embraced gas-fired generation in order to push for further integration of natural gas into the power generation matrix and increase the reliability of supply. Most of the successful projects in recent energy auctions brought in their business model natural gas plants linked to LNG import terminals. Low LNG prices have made these

³³ International Energy Agency and Korea Energy Economics Institute. LNG market trends and their implications, structures, drivers and developments of major Asian importers. June 2019

³⁴ "La Argentina exportará gas a Chile con contratos no interrumpibles, después de 13 años", Telam, August 21, 2019

³⁵ Paraskova, Tsvetana "Rising Vaca Muerta Shale Output Makes Argentina LNG Exporter", in Oil Price, July 12, 2019. See also, "Argentina's YPF sells first commercial LNG cargo to Petrobras", in Reuters, November 14, 2019.

³⁶ "McDermott bags Vaca Muerta LNG gig from YPF", in LNG World News, July 19, 2019.

³⁷ "Plano Decenal de Expansão de Energia 2027," Ministério de Minas e Energia -EPE, 2018.

projects quite competitive. Four of the integrated LNG-to-power winning projects are worth mentioning:

- **Porto de Sergipe 1:** the 1.5-gigawatt (GW) Porto de Sergipe I project, on the coast of the state of Sergipe, was awarded in April 2015 to Centrais Elétricas de Sergipe S.A. (CELSE), a partnership between EBrasil and Golar Power.³⁸ Porto de Sergipe I is expected to supply power to the Brazilian northeast helping firm growing wind power supply in the region. The project will source its fuel under a long-term LNG sale and purchase agreement (SPA) with an Exxon Mobil and Qatar Petroleum joint venture for 1.3 million tons per annum (Mtpa) of LNG on an ex-ship basis and delivery starting in 2020.³⁹ While LNG imports into the country have taken place since 2009 on short term agreements or spot base transactions, reportedly this is the first time a long term LNG SPA has been signed for deliveries to Brazil. As of December 2019, the Golar Nanook Floating Storage Regasification Unit (FSRU), with 21 million cubic meters per day (Mcm/day) of regasification capacity and 170,000 cubic meters of LNG in storage capacity, was reported to be already onsite under a 26- year charter agreement to CELSE. Both the power plant and LNG terminal are expected to come online in early 2020.
- **GNA I and GNA II:** Gás Natural Açú (GNA), a joint venture between Prumo Logística, BP and Siemens, is developing a significantly large natural gas-fired thermal power compound at the Açú Port Complex, at São João da Barra in Rio de Janeiro state. The power project is a 3GW integrated LNG-to-power project being developed in two phases. The 1.3 GW GNA I plant is scheduled to begin commercial operation in January 2021, while the 1.7 GW GNA II plant is expected to start commercial operation in January 2023. The feed gas for both plants will be supplied by BP under long term LNG agreements. GNA has contracted the BW Magna FSRU, with a regasification capacity of 21 Mcm/day and storage capacity of 173,400 cubic meters of LNG, to be permanently anchored at the Açú Port Terminal 2 under a 23-year charter contract. As of December 2019, GNA had obtained regulatory approval for LNG imports and satisfied lender conditions for the first phase of the project, which is reportedly at 87% completion. The BW Magna FSRU is currently on route to Port Açú.⁴⁰
- **Barcarena:** Three gas-fired power plant projects were among the winners of the A-6 auction for new capacity held in October of 2019, including Golar Power’s sponsored 605MW Novo Tempo Barcarena plant in the state of Pará. Golar’s combined cycle plant will utilize imported LNG through an FSRU. Golar Power anticipates accelerating the development of a new LNG Terminal at the Port of Vila do Conde. The Terminal is expected to commence operations by mid-2021. FSRU selection and detailing of the terminal are under way with an anticipated final investment decision in the first trimester of 2020.⁴¹ In addition to supplying the power plant, Golar also wishes to expand LNG use in the states of Pará and

³⁸ 50/50 joint venture between Golar LNG and Stonepeak Infrastructure Partners.

³⁹ The partners are also jointly developing offshore blocks in the Campos and Santos basins. See “Porto de Sergipe I Power Project, Barra dos Coqueiros”, in Power Technology.

⁴⁰ “CWC World LNG Award 2019 Shortlist”, in Natural Gas World, November 22, 2019.

⁴¹ Golar Power Press Release. “Golar Power awarded PPA for 605MW LNG-to-Power Project in Barcarena, Brazil”, October 21, 2019.

Amazonas through cabotage using small-scale LNG vessels or through C-type cryogenic tanks and vaporizer kits installed in consumer locations.

In addition to these projects, according to EPE another 9 LNG regasification terminals are already in the licensing stage.⁴² It is uncertain how many of these projects will be developed. Some of them envision connecting the regasification facility with the existing pipeline import and distribution network so as to permit regasified gas to be marketed among industrial and residential customers.

As shown in Figure 2, about 50% of gas marketed in Brazil is consumed by the industrial sector.⁴³ High natural gas prices are a recurring complaint of industrial consumers. In 2018, according to EPE calculations, the price of natural gas for industry was around \$14/MMBtu while in Europe and the US, prices paid by this customer class were significantly lower, \$8.84/MMBtu and \$3.89/MMBtu, respectively.⁴⁴ Government efforts to enhance competition and transparency in price formation are expected to result in lower prices that can help expand industrial demand.

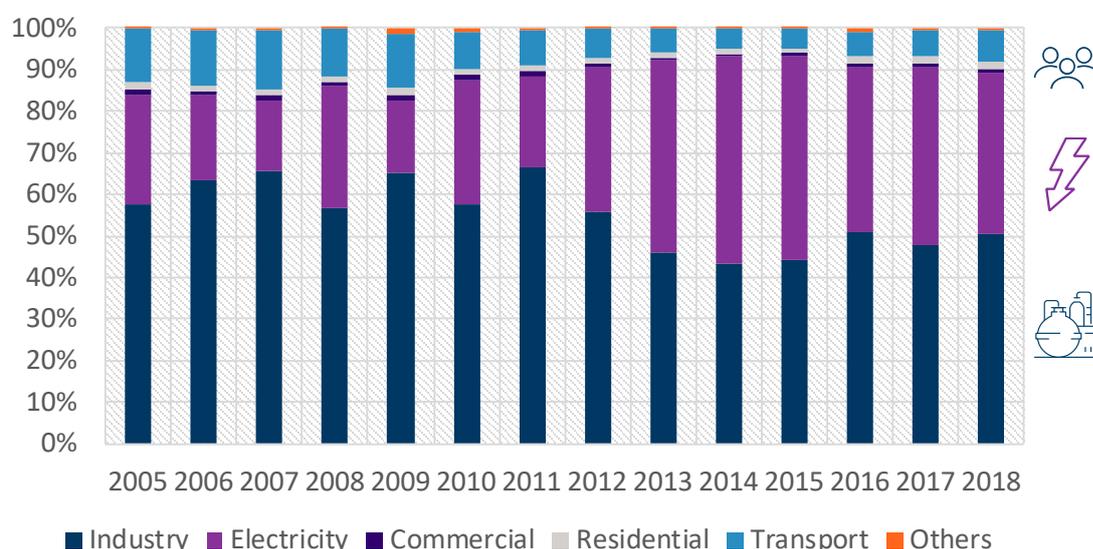


Figure 2 Brazilian natural gas consumption by sector (2005-2018)⁴⁵

Another possible outlet for increased use of natural gas is the transportation sector. In particular, there is a great opportunity to substitute the use of imported diesel in heavy duty trucks, public transport buses, locomotives and boats. According to Golar Power, current diesel imports into Brazil amount to 40 Mm3/day, which is equal to all gas traded by distributors. The average price of imported diesel in 2018 was reported at \$0.540 / liter or \$14.90 /MMBtu.⁴⁶ As

⁴² Empresa de Pesquisa Energética- EPE. “Terminais de Regaseificação de GNL no Brasil Panorama dos Principais Projetos”, August 30, 2019.

⁴³ Balanço Energético Nacional – 2018 published by Empresa de Pesquisa Energética - EPE

⁴⁴ “Nota Conjunta - Comitê de Promoção da Concorrência do Mercado de Gás Natural,” Ministério da Economia - Ministério de Minas e Energia, 8 July 2019. EPE. “Informe: Comparações de Preços de Gás Natural: Brasil e Países Selecionados”, April 18, 2019

⁴⁵ Author with data from MME. Available online at: <http://www.mme.gov.br/web/guest/secretarias/petroleo-gas-natural-e-biocombustiveis/publicacoes/boletim-mensal-de-acompanhamento-da-industria-de-gas-natural>

⁴⁶ Silva, Celso. “Gás Natural: combustível do futuro ou do presente?”, O novo mercado de gás natural: opiniões de especialistas, perspectivas e desafios para o Brasil”, FGV Energia, August 2019, at pp. 25-26.

reported by EPE, in 2017 and 2018, the prices of natural gas available domestically ranged between \$6.00 and \$8.00/MMBtu.⁴⁷ Given the price differential, the substitution proposition looks awfully attractive.

In Need of a Policy Signal

Fate and reform have created ideal conditions for market expansion in the Brazilian natural gas sector. The proposed regulatory overhaul coupled with the retrenchment of Petrobras is opening room for other players in each segment of the value chain. Learning from previous failed reform experiences, the government has opted for a “carrot and stick” approach this time around. By offering Petrobras a chance to avoid hefty fines and states financial incentives in exchange for self-reform, the Bolsonaro administration expects to tackle the challenge of market concentration. The hope is that as the market liberalizes, expansion will take place and the losses incurred by states and the incumbent will be offset by gains from demand growth.

However, to encourage domestic demand to the levels required for further market expansion, a clear policy signal that favors natural gas over competing, but dirtier or unreliable fuels is needed. While it is clear that the crown jewels in the natural gas sector mid and downstream segments will be attractive to large investors, a larger spectrum of private sector interest will be necessary to finance transportation and distribution infrastructure beyond the coastal areas. Investment most likely will materialize if and when there is clarity that natural gas will play a greater role in the country’s energy mix going forward.

⁴⁷ Prices exclude transport and taxes.