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IMPROVING THE REGULATORY FRAMEWORK IN THE NATURAL GAS SECTOR IN BRAZIL

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ABSTRACT/RÉSUMÉ

Improving the regulatory framework in the natural gas sector in Brazil

This paper describes and analyses recent reforms in the natural gas market in Brazil aimed at fostering a more open, competitive, efficient, and flexible gas sector. This paper reviews the changes in the regulatory framework using two lenses: the reform process seen through a regulatory policy lens and the resulting regulatory framework using the OECD Product Market Regulation (PMR) indicator. The paper includes policies options to further improve the regulatory framework in the sector and reap the full range of benefits of the reforms.

This Working Paper relates to OECD Report on Regulatory Reform in Brazil, 2022 https://www.oecd.org/governance/regulatory-reform-in-brazil-d81c15d7-en.htm

JEL codes : L51; L95; N76

Keywords: Regulation, Competition, Product Market Regulation, Brazil, Network Sectors

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Améliorer le cadre réglementaire du secteur du gaz naturel au Brésil

Ce document décrit et analyse les récentes réformes du marché du gaz naturel au Brésil visant à favoriser un secteur gazier plus ouvert, plus compétitif, plus efficace et plus flexible. Ce document examine les changements apportés au cadre réglementaire en utilisant deux optiques : le processus de réforme vu sous l'angle de la politique réglementaire et le cadre réglementaire qui en résulte en utilisant l'indicateur de la réglementation des marchés de produits (RMP) de l'OCDE. Le document comprend des options politiques visant à améliorer davantage le cadre réglementaire du secteur et à tirer parti de tous les avantages des réformes.

Ce Document de travail a trait au OECD Report on Regulatory Reform in Brazil, 2022
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JEL codes : L51; L95; N76

Mots clés : Réglementation, Concurrence, Brésil, Secteurs des réseaux

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Improving the regulatory framework in the natural gas sector in Brazil

By Cristiana Vitale, Manuel Gerardo Flores Romero, Pedro Caro de Sousa, Alexis Durand, Gloriana Madrigal and Paul Yu[1]

Introduction

This paper describes and analyses recent reforms in the natural gas sector in Brazil and highlights options to improve further the regulatory framework in the sector and reap the full range of benefits of the reforms. It starts by providing an overview of recent modifications to the regulatory framework in the sector, then analyses these changes through regulatory policy and competition lenses.

Overview of the regulatory framework in the natural gas sector in Brazil

Production and consumption of natural gas in the country have increased steadily since 1990 (Figure 1), however the reforms undertaken until the mid-1900s failed to create a competitive gas market, limiting the benefits for the country, its citizens, and its businesses.

The regulatory framework that underpins the natural gas sector in Brazil has evolved since the introduction of the Petroleum Law (Law 9.478/1997), which opened the oil and gas state monopoly and allowed the participation of other market participants besides the state company Petrobras. In 2009, Brazil approved the Gas Law (Law 11.909/2009), which was issued as a result of the very limited increase in the number of participants in the natural gas market when Petrobras' monopoly was ended. The Gas Law introduced

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a concession regime for the transportation of natural gas and regulated the access to the pipeline transportation system.

In 2016, Brazil launched the Gas to Grow Initiative (*Gás para Crescer*). The initiative aimed at reforming the legal framework of the natural gas sector to encourage competition by unbundling transportation activities, opening the natural gas market and introducing negotiated access to essential infrastructure, among others. The reform process was characterised by a strong engagement with relevant stakeholders to develop a new law based on international experiences, particularly that of the European Union. While a law proposal was introduced, it was not until 2021 that a new legal framework was approved.

Figure 1. Brazil's natural gas final consumption and gross production

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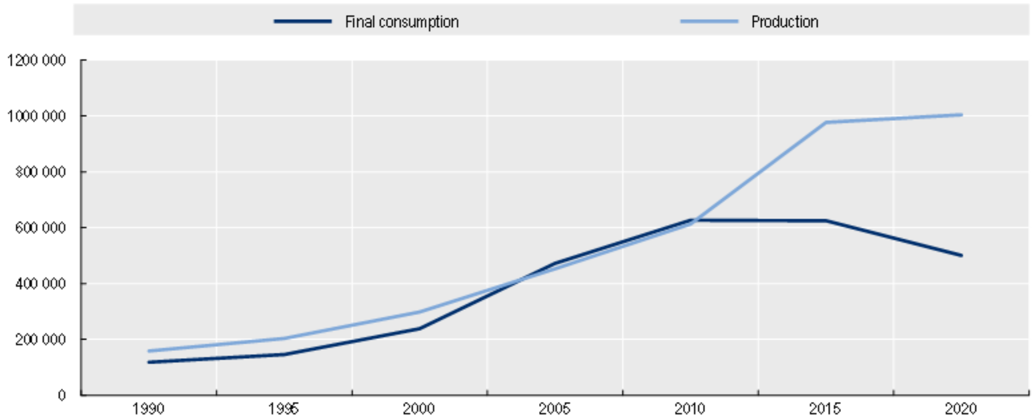


Note: This chart plots the gross production and final consumption of natural gas in Brazil. The final consumption figures exclude deliveries for transformation and use of natural gas by the energy-producing industries. A significant amount of the gas produced in the country gas is used for reinjection and consumption in production facilities before final consumption, and Brazil is a net importer of natural gas.
Source: (IEA, 2021[11]).

In 2021, the New Gas Law (*Nova Lei do Gás,* Law 14.134/2021) came into force as part of the New Gas Market Programme (*Novo Mercado de Gás*) introduced in 2019. Among the key aspects of this reform is the Cease and Desist agreement between Petrobras and the Brazilian competition authority (the Administrative Council for Economic Defence, CADE) to reduce its market participation by divesting assets in the transportation and distribution segments. The main objective of the New Gas Market programme is to boost competition, following four key principles: unbundling, non-discriminatory third-party access, entry-exit transportation system, and transparency. Fostering harmonization between federal and state level regulations is also a key element of the Programme since the distribution segment of the industry is regulated by the states.

The process of evaluation of the previous regulatory framework, as well as the definition of the new norms and laws, has been a co-ordinated effort that involved several stakeholders from the Brazilian administration. The following sub-section lists the main actors and their main attributions regarding the natural gas sector.

Key stakeholders in the natural gas sector

Ministry of Mines and Energy (MME)

The Ministry of Mines and Energy was established in 1960 and it is the institution responsible for the design of the national policy on natural gas. Decree 9.675/2019 states the attributions of the Ministry, which include the definition of the policy on exploration and production of energy resources, the establishment of guidelines on planning and on setting tariffs. Moreover, the MME, in collaboration with the regulatory agencies and other institutions, the following:

- Monitors and evaluates the conditions and evolution of natural gas supply
- Suggests measures that minimise the risk of shortages in exceptional situations
- Co-ordinates and promotes programmes to attract investments and businesses.

The Secretariat for Oil, Natural Gas and Biofuel is the administrative unit inside the MME that proposes the guidelines for the execution of bids for areas aimed at the exploration and production of natural gas. It monitors the performance of the sector and, in collaboration with the National Agency of Petroleum, Natural Gas and Biofuels (ANP), it tracks the rational use of the reserves of hydrocarbons.

Casa Civil (Presidency of the Republic)

The Casa Civil is at the centre of the federal administration and it is directly linked to the Presidency of the Republic. Casa Civil co-ordinates and integrates government policies and actions and provides support in the monitoring and evaluation of policies and of the management of entities of the federal administration. In particular, the Deputy Chief of Analysis and Monitoring of Government Policies (SAG) is in charge of assessing the merit and coherence of the government's programmes and policies. In case SAG deems it necessary, it can request a regulatory impact assessment (RIA) for a regulatory proposal (law or decree).

Ministry of Economy

The Ministry of Economy is responsible for the national economic policy, national strategic planning, financial administration and public accounting, reduction of bureaucracy, social security, economic and financial negotiations with governments, multilateral organizations and government agencies and for the elaboration of materials and information for the development of long-term public policies. The Ministry is also responsible for competition advocacy in the natural gas sector.

National Agency of Petroleum, Natural Gas and Biofuels

The National Agency of Petroleum, Natural Gas and Biofuels (ANP) was instituted by Law 9.478/1997 and regulated by Decree 2.455/1998. Its main responsibilities concern the regulation, contracting and inspections of the economic activities related to the energy sector. The creation of a regulatory agency for the oil, natural gas and biofuels sectors is one of the results from the opening of the monopoly that Petrobras used to hold. The ANP regulates the extraction, transportation, treatment, processing, storage, liquefaction, commercialisation, among others, of natural gas in Brazil.

Energy Research Office (Empresa de Pesquisa Energética, EPE)

The Office carries out research activities and produces studies that the Ministry of Energy and Mines uses to support the strategic planning of the energy sector, which includes the natural gas sector. The EPE was created with the objective of ensuring that the government has the adequate information and analyses for the development of the infrastructure, policies, and guidelines for the energy sector in the country.

Administrative Council of Economic Defense (Conselho Administrativo de Defesa Econômica, CADE)

CADE is Brazil's competition authority. It is an autonomous agency (linked to the Ministry of Justice and Public Security) and has three broad objectives: review and decide on mergers, acquisitions, and other transactions that may affect economic competition; investigate, and if necessary, sanction abuses of competition law; and perform competition advocacy activities.

In particular, Petrobras signed a Term of Commitment to Cease Anticompetitive Practices (TCC) with CADE. This means that CADE's investigation of Petrobras' potential anticompetitive practices is suspended as long as Petrobras complies with the dispositions in the TCC.

National Economic and Social Development Bank (Banco Nacional de Desenvolvimento Econômico e Social, BNDES)

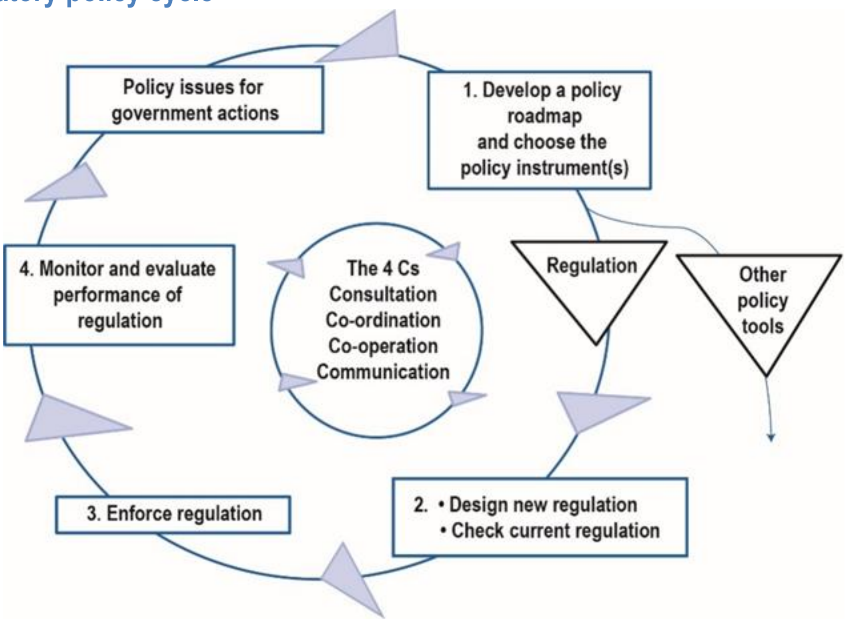
BNDES is the main entity providing long-term financing for projects contributing to the expansion of industry and infrastructure in Brazil. To support the development of Brazilian natural gas industry, BNDES has carried out studies of opportunities for investments and has proposed measures to foster investments.

Use of regulatory management tools in the reform process

Regulation is one of the levers that governments have to pursue public policy objectives. A high-quality regulatory framework can help countries move closer towards their environmental, social, and economic goals. Reaching and maintaining a regulatory framework that has the public interest at its core is not necessarily an easy task. More often than not, regulations generate unintended consequences, have impacts on citizens and businesses, and need to keep up in a constantly-changing world.

The OECD proposes that administrations see the rule-making process as a cycle that encompasses several steps, starting with the identification of the public policy problem and concluding with the evaluation of the regulatory alternative after its implementation (see Figure 2). This aids administrations to develop norms that generate greater benefits than costs and that remain relevant in light of the underlying policy goals.

Figure 2. Regulatory policy cycle



Source: (OECD, 2011[2]).

The modification of the regulatory framework for the natural gas sector in Brazil could be analysed through the lens of the regulatory policy cycle. As there was already in place a set of regulations that underpinned the sector, the natural place to begin the analysis is the evaluation of the stock of norms and rules. The OECD recommends that *ex post* evaluations have three characteristics (OECD, 2020[3]):

- Be integral and permanent part of the regulatory cycle

- Be comprehensive
- Include an evidence-based assessment of the actual outcomes from regulatory action and contain recommendations to address any deficiencies.

The following sections will provide a description of the process for the evaluation of the previous laws and decrees and the development of the new regulatory framework for the natural gas sector in Brazil. Both the assessment of the New Gas Law (and to a certain extent the Gas to Grow Initiative) and the elaboration of the New Gas Market were underpinned by stakeholder engagement activities. These efforts are also considered in the following sections.

Evaluation of the previous regulatory framework

The approval of the New Gas Law (Law No. 14.134/2021) is the culmination of over four years of work focused on improving the regulatory framework for natural gas in Brazil. The previous law for the sector, the Gas Law (2009), had not increased the number of participants in the market. In fact, Petrobras remained the dominant agent years after the opening of the market and the formal end of the state monopoly. The Gas to Grow Initiative was introduced with the main objective of reviewing the regulatory framework to boost the participation of more companies in the market. There was already widespread agreement that the previous framework had failed to foster competition in the natural gas value chain. As such, Brazil did not carry out an *ex post* assessment as to why the Gas Law had failed to deliver some of its objectives.

In 2016, the National Council for Energy Policy emitted a set of strategic directives that defined the basis for the development of the Gas to Grow Initiative (Resolution 10/2016, CNPE). The elaboration of the Gas to Grow Initiative included the conformation of nine work fronts with the objective of stimulating participation and dialogue between representatives of the public administration and the industry. Furthermore, eight sub-committees carried out an in-depth analysis of key topics and engaged with a wide range of stakeholders of the sector to create proposals for reform (please refer to Table 1 for a list of the sub-committees). In these groups, specific articles or regulations that referred to the topic covered by each sub-committee were assessed. The former was done taking as reference the objectives of the strategic directives as well as international experiences. The scope of the analyses performed by the sub-committees varied across the board. While in most cases the assessment was exhaustive, it did not include a thorough evaluation of the potential costs and benefits of the new regulatory framework. In some sub-committees, the expected benefits and risks were described qualitatively. In addition to the eight sub-committees, there was also a working group that analysed the need of a supplier of last resort for the Brazilian market.

Table 1. Sub-committees of the Technical Committee for the Development of the Natural Gas Industry

Sub-committees
Upstream pipelines, Processing and Liquefied Natural Gas (LNG) (*Escoamento, Processamento e GNL*)
Transportation and storage (*transporte e estocagem*)
Distribution (*Distribuição*)
Commercialisation (*Comercialização*)
Improvement of tax rules (*Aperfeiçoamento das regras tributárias*)
Natural gas as raw material (*Gás Natural Matéria Prima*)
Use of the Gas of the Union (*Aproveitamento do Gás da União*)
Integration of the Electric and Natural Gas Sectors (*Integração Setores Elétrico e Gás Natural*)

Source: (Ministério de Minas e Energia, 2021[4]).

In several of the sub-committees, stakeholders agreed on potential solutions and suggested adjustments to the legal text. The proposals presented by the sub-committees became part of the Law Proposal (*Projeto de lei, PL*) 6.407/2013 (later re-numbered PL 4.476/2020), which was not approved by the Congress during the period of that legislative term. For more details on the reforms proposed, please refer to Table 2.

Nevertheless, those proposals that did not require to go through Congress for their approval or that represented adjustments in the regulation of the legal framework were implemented (namely, those related to the entry and exit model, Decree 9.616/2018).

Table 2. Reforms proposed in the Gas to Grow Initiative

Segment	Gas Law (2009)	Gas to Grow
Transmission pipelines	Capacity hired point-to-point on long-term contracts	Formation of entry-exit systems
	Legal unbundling	Ownership Unbundling (OU) for new transmission system operators (TSOs). Existing ones must apply for an Independent Certification (according to ANP regulation)
	Operation coordinated by Petrobras	Operation coordinated by Independent Market Area Manager
	Auctions for new pipelines and expansions (concessions)	Authorisation regime for new pipelines and expansions
	Ten years planning published by MME based on EPE studies	1. Indicative planning by EPE 2. Investment planning submitted by TSOs and approved by ANP after public consultation
		Capacity release
		ANP can start a gas release program after hearing the competition authority
Commercialisation		Open market regulated by the Federal government together with the states
Distribution	Open market ("free consumer") regulated by the states	Open market regulated by the Federal government together with the states
Upstream infrastructure and LNG terminals	No third party access (TPA)	Negotiated non-discriminatory TPA, based on good practices code
Storage	Concession after auction process	Authorisation (permit)

Source: (Ministério de Minas e Energia, 2018[5]).

Engagement with stakeholders to review existing regulations and define reforms

The participation of a broad range of stakeholders was key to reform the Gas Law. The identification of the aspects that could be improved from the previous regulatory framework was supported with the inputs of stakeholders from the public administration, industry, academia, and civil society as well as international experts. In October 2016, and in the framework of the Gas to Grow Initiative, the Ministry of Mines and Energy submitted to public consultation the draft Strategic Guidelines for the design of the new natural gas market in Brazil (*Diretrizes Estratégicas para o desenho de novo mercado de gás natural no Brasil*). The document was available for public consultation for a month. The Operational Core[2] (*Núcleo Operacional*) that was leading the programme provided technical information and additional documents to support the draft proposal.

After the consultation process was completed, the contributions and feedback of over 50 participants were summarised. The report of the participation in the public consultation included an analysis of the comments

[2] The Núcleo Operacional refers to the group responsible for the development of a proposal of the new design of the gas market in Brazil. The group includes the Ministry of Mines and Energy, the National Agency of Oil, Natural Gas and Biofuels, and the Energy Research Office.

received as well as feedback from the Operational Core describing what aspects were taken into consideration. Finally, the document contained the final version of the legal texts to reflect the comments that were considered as relevant.

In December 2016, the National Council for Energy Policy (*Conselho Nacional de Política Energética*, CNPE) approved the Strategic Guidelines for the design of the new natural gas market in Brazil (Resolution 10/2016, CNPE). Besides the 19 strategic guidelines that should underpin the gas market in Brazil, it mandated the creation of the Technical Committee for the Development of the Natural Gas Industry (CT-GN), which was responsible for proposing the specific modifications to the regulatory framework of the sector. The Committee was composed by representatives from the Presidency, relevant ministries, regulatory agency, the Energy Research Office, the National Forum of State Secretaries of Mines and Energy, and the Brazilian Association of Regulatory Agencies. The Committee, and the sub-committees mentioned in Table 1, were also encouraged to engage with representatives from other public or private associations and institutions.

The new regulatory framework for the natural gas sector: its development

The second attempt of reform of the natural gas sector was the New Gas Market (2019). This programme continues the work of the Gas to Grow Initiative and defines guidelines for energy policies, especially for the natural gas sector (Resolution 16/2019 of the National Council for Energy Policy). Given previous attempts to modify the legal framework of the sector, the New Gas Market's objectives looked into increasing consensus among stakeholders to ensure a better reception of the dispositions and an easier adoption of the new law.

While the process for the modification of the gas law built heavily on the inputs and expertise of stakeholders from the public, private and international arena, other aspects also played a key role. In particular, the establishment of the Committee of the Promotion of the Competition in the Natural Gas Market in Brazil and the measures taken by the antitrust watchdog, CADE. The Committee for the Promotion of the Competition in the Natural Gas Market in Brazil (created by Resolution 4/2019, CNPE) was responsible for proposing actions aimed at increasing competition in the sector, fostering the adoption of good regulatory practices, and making recommendations to the National Council for Energy Policy. For that, this Committee, through the Ministry of Mines and Energy, carried out an analysis of market concentration and performed a multi-criteria analysis to inform decision making and to estimate the potential impacts of the reforms in the market and on competition (Comitê de Promoção da Concorrência no Mercado de Gás Natural do Brasil, 2019[6]). This resulted in the Resolution 16/2019, CNPE, that establishes guidelines and improvements to energy policies aimed at promoting free competition in the natural gas market. In parallel, CADE, that also integrated the Committee, took actions to reign in the market power of Petrobras. Petrobras signed an agreement with the Administrative Council of Economic Defence to reduce its participation in the natural gas market.

Moreover, Decree 9.934/2019 created the Monitoring Committee for the Opening of the Natural Gas Market (CMGN). The CMGN grouped representatives from several agencies and ministries (Box 1) and introduced three working groups to deepen the understanding of specific aspects of the reform, namely the integration between the natural gas sector and the electric sector, the integration between the natural gas sector and the industry and tax and customs aspects.

Box 1. Monitoring Committee for the Opening of the Natural Gas Market

The Committee was established by Decree 9.934/2019 with the objective of monitoring the implementation of the measures introduced as part of the New Gas Market Programme (*Novo Mercado de Gás*). The Committee is composed by representatives from Casa Civil, the Ministry of Economy, ANP, the Energy Research Office, Administrative Council of Economic Defence, and the Ministry of Mines and Energy, which is also the co-ordinator. Every three months the Committee publishes a report with the main developments in the natural gas sector, in particular it provides information on the following items:

- Increase of economic competition
- Harmonisation of state and federal regulations
- Reduction of fiscal barriers
- Integration of the natural gas sector with the industrial and electric sectors.

The approval of the new law for the natural gas sector in Brazil was only one of the steps to achieve all the objectives considered in the New Gas Market. In fact, several bylaws, decrees and regulations have to be reviewed, modified or emitted to ensure that the legal framework is coherent and efficient. At the moment of preparation of this report, the New Gas Law[3] (Law 14.134/2021) and its bylaw[4] (Decree 10.712/2021) have been approved (Box 2). Moreover, the National Agency of Oil, Natural Gas and Biofuels has published a regulatory agenda for the following years, where it details the regulations to be reviewed or developed. According to the agenda, the ANP will continue with the improvement of the regulatory framework at least until 2023.

Box 2. The new regulatory framework for the gas sector

In Brazil, both the federation and the state governments play a role in the regulation of different segments of the natural gas sector. The federal administration is responsible for the transportation, storage, conditioning, gathering, liquefaction, regasification, treatment, and processing of natural gas. The National Agency of Petroleum, Natural Gas and Biofuels (ANP) is the federal institution in charge of granting the authorisations for the performance of the previous activities. On the other hand, state administrations regulate the distribution of natural gas.

New Gas Law (Law 14.134/2021)

The New Gas Law, approved on 8 April 2021, brought important changes to the natural gas sector, as it aims at increasing the number of market participants, improving transparency, reducing the natural gas prices, and fostering competitiveness. Among the most relevant reforms for the sector are:

- The activities of transportation and underground storage will be under an authorisation regime instead of a concession regime. This means that parties that would like to engage in these activities should request an authorisation from the ANP and are no longer required to go through a public tender for concession.
- Unbundling of the transportation segment
- Negotiated access to essential installations
- Unbundling of the distribution activities
- Promotion of multi-level regulatory coherence, by stimulating collaboration between the Ministry of Mines and Energy, ANP and the state regulators.

[3] Published on 9 April 2021.

[4] Decree 10 712/2021 was published on the Official Gazette on 4 June 2021.

Decree 10.712/2021

The Decree 10.712/2021 published on 4 June 2021, regulates several of the dispositions established in the New Gas Law. This piece of legislation sheds light on key topics included in the New Gas Law and narrows down certain technical aspects, such as the classification of transportation pipelines and clarifies points of controversy with sub-national administrations. In particular, the Decree defines mechanisms for the articulation between the federal and sub-national spheres. Among these mechanisms are:

- The creation of knowledge networks, where federal and state regulators, as well as other stakeholders participate.
- The proposal by ANP of guidelines for state regulation. Their adoption is voluntary.
- The establishment of the National Pact for the Development of the Natural Gas Market (*Pacto Nacional para o Desenvolvimento do Mercado de Gás Natural*), which states can join on a voluntary basis.

Moving forward, one of the most relevant challenges for the achievement of the objectives of the New Gas Market is the harmonisation of regulations across states. Evidence collected by the OECD team showed that the multi-level regulatory governance of the natural gas sector has been a source of tensions between the sub-national administrations, particularly the states, and the federal government. Currently, the Federation has put in place mechanisms to incentivise harmonisation by creating a knowledge network for the exchange of good regulatory practices and by providing guidelines that states can adopt in a voluntary basis.

Areas for Improvement and Suggestions for Reform

The Recommendation of the Council on Regulatory Policy and Governance (OECD, 2012[7]) advises governments on the effective use of regulation to achieve better social, environmental, and economic outcomes. It also provides governments with clear guidance on the principles, tools and institutions required to improve the design, enforcement, and review of their regulatory framework to the highest standards. Some of these tools include *ex ante* assessment of regulation, through the Regulatory Impact Assessment (RIA), *ex post* analysis of the regulation, and stakeholder engagement. The underlying principle of these tools is to ensure that regulations be based on evidence.

Ex post analysis allows policy makers to take stock of the outcomes and achievements of existing laws and regulations. It helps define to what extent the underlying policy objectives have been achieved, and whether the law or regulations under scrutiny had produced other unexpected or undesirable impacts. The report *Reviewing the Stock of Regulation, OECD Best Practice Principles for Regulatory Policy* (OECD, 2020[3]) offers advice to government officials on what methods steps and practices could be followed to undertake *ex post* analysis of regulations.

RIA is a regulatory management tool that helps policy makers think critically on the policy objectives of the draft regulation ahead of its implementation. It offers a method to identify the policy problem to be solved, define different alternatives to tackle the challenge, and through an assessment of the expected benefits and costs of each alternative, choose the more efficient form of policy intervention. (OECD, 2022[8]) contains an in-depth assessment of Brazil's performance in this area and provides detailed policy recommendations.

One of the fundamental elements of both RIA and *ex post* analyses of regulations is to ensure that stakeholder engagement activities are carried out. The interaction with an ample range of relevant actors allows policy makers to collect evidence, contrast points of view and create ownership of the reform, which feeds positively into the assessment of both current and draft regulation. The report *OECD Best Practice*

Principles on Stakeholder Engagement in Regulatory Policy (OECD, 2017[9]) aims to provide policy-makers and civil servants in both OECD member and partner countries with a practical instrument to better design their stakeholder engagement strategies.

In the case of the two last exercises of reforming the regulatory framework of gas in Brazil - the Gas to Grow Initiative and the New Gas Market Programme – there are elements to ascertain that these exercises were congruent with good practices on *ex post* analysis, RIA, and stakeholder engagement, although with varying degrees.

Stakeholder engagement practices were used intensively in both cases of reforms. Consultation with an ample range of stakeholders provided the administration with evidence, which was employed to assess the existing framework and analyse the merits of the reform in the gas sector, as well as to build consensus. The processes also came across as transparent and inclusive.

For the case of *ex post* analysis, before the introduction of the Gas to Grow Initiative, there was some consensus among relevant parties that the Gas Law was not delivering the expected results, and thus there was a need for reform of the regulatory framework. The Gas to Grow Initiative included many technical assessments of the existing framework.

Regarding RIA, it is commendable that there were efforts to assess the expected net benefits of the reforms, but these exercises were limited to qualitative techniques. A positive aspect to highlight, however, is the use of evidence to inform the reform, as the process benefited from engaging a wide range of stakeholders since the early stages and from the development of technical inputs and documents. When considering the additional steps recommended later in this report as part of the ongoing reforms in the gas sector, Brazil should aim at undertaking quantitative analysis of the anticipated benefits and costs of the regulatory changes to the extent possible.

When the New Gas Law (April of 2021) and its bylaw, Decree 10.712/2021, were published, no formal process of preparing an RIA was followed. Although the Ministry of Mines and Energy had no legal obligation to do so, these documents represent the legal foundations for the New Gas Market and would have benefited of being assessed under this lens. Brazil could consider following more closely the *ex post* assessment and RIA methodology to inform reforms with an expected large economic and social impact, such as the natural gas sector.

The reform of the natural gas sector in Brazil and its impact on competition

Over the past decade, Brazil has sought to reform its energy sector, along the same lines followed by OECD economies. Reforming energy sectors in the OECD have mostly consisted of countries moving from vertically integrated state monopolies to an effectively competitive industry. This transition requires both reducing state control over firms in the sector, as well as introducing a regulatory framework that allows new, and more efficient firms to enter and consumers to switch towards those firms that offer the best deal.

When assessing regulatory framework for their impact on competition, the OECD relies on its Product Market Regulation (PMR) indicators, which measure the presence of regulatory barriers to firm entry and growth that impede the efficient working of competition in product markets (Box 3). As such the PMR indicators can help to identify areas where Brazil performs less well than its OECD peers, and the steps it could take to bring its regulatory framework in line with international best practices.

The OECD PMR indicator for the natural gas sector captures the legal barriers to entry and expansion that firms face in this sector. Given that Brazil is currently undertaking a reform process in its gas industry akin to the ones undertaken by other OECD countries, evaluating the state of reforms using the OECD PMR indicator as a benchmark can provide valuable insights, and suggest policy options that could further help Brazil to open its natural gas sector to competition.

Box 3. The OECD Product Market Regulation (PMR) indicators

The OECD PMR indicators are a unique and globally-recognised set of policy indicators that measure the presence of regulatory barriers to firm entry and growth that impede the efficient working of competition in product markets. These are barriers to competition that go beyond what may be needed to address the policy objectives and the market failure(s) regulation may be intended to address.

Over time, the PMR indicators have become an essential element of the OECD's policy analysis toolkit. These indicators and their underlying database are also widely employed by national governments and other international organisations to determine areas for regulatory change.

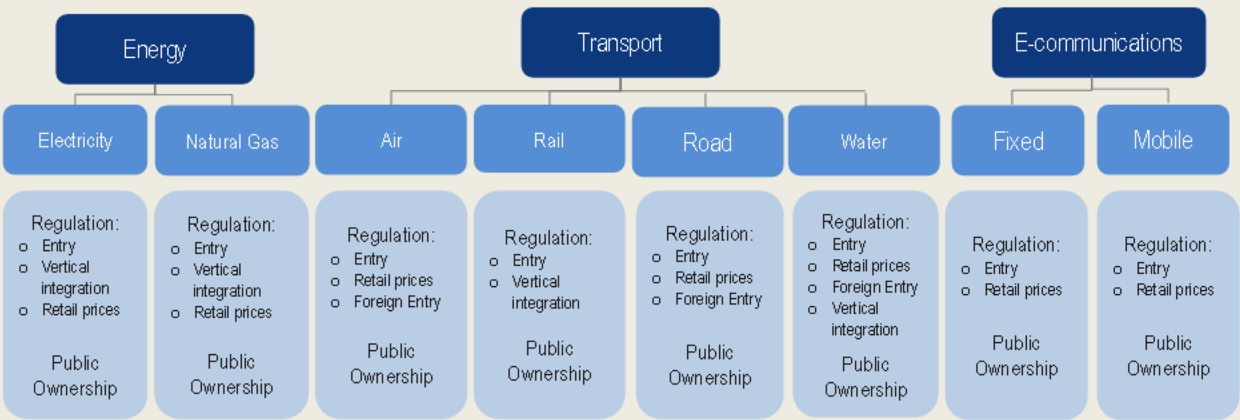
The PMR indicators rely on an extensive database on laws and regulation based on answers provided by national authorities to a detailed questionnaire. The information included in this database is used to build two sets of indicators[5]: an economy-wide indicator, which provides a general quantitative measure of how competition-friendly a country's regulatory framework is, and a group of sector indicators that perform a similar assessment at the level of specific network and service industries. (Vitale et al., forthcoming[10]) assesses Brazil's performance in the PMR indicators in more detail.

PMR Network Sectors Indicators

The PMR network sectors indicators assess the level of public ownership and how entry and conduct are regulated in eight sectors: electricity, natural gas, air transport, rail transport, road transport, water transport, as well as fixed and mobile e-communications.

These eight indicators are then aggregated into three indicators, one for each industry (energy, transport, and e-communications) (Figure 3).

Figure 3. Structure of the 2018 PMR indicators for network sectors



Source: (Vitale et al., 2020[11]).

5 To calculate the indicators, the qualitative information is transformed into quantitative information by assigning a numerical value to each answer. This coding is based on accepted international best practices. The coded information is normalised over a zero to six scale, where a lower value reflects a more competition-friendly regulatory stance.

The natural gas sector and its evolution around the world

The gas sector is a network industry

The gas sector is a network industry, as it requires a network to connect producers and consumers. Such a network can entail fixed installation costs that are so high, and economies of scale that are so significant, as to make it efficient for only one firm to run the network over a certain geographic area. This means that some segments of this industry present the characteristics of a natural monopoly.

These characteristics, coupled with concerns related to the public interest in ensuring widespread consumer access to energy, security of supply, in the past led to the gas sector being a vertically integrated monopoly across all segments and under state ownership.

Starting in the 1980s, the role that the government could usefully play in the business sector was subject to a thorough reassessment in many OECD countries. A consensus emerged that the scope for public enterprises was narrower than previously thought, even in network industries, such as the gas one. On the one hand, it was felt that managerial incentives would be enhanced by privatisation, including by severing the link between managers and politicians, thereby lowering the deadweight costs associated with influence-seeking activities (OECD, 2000, p. 154[12]). On the other, it was found to be desirable to facilitate competition in industry segments that could sustain it, as a tool for controlling costs and promoting investments and innovation, to the ultimate benefit of final users and consumers (OECD, 2001[13]).

A consequence of this reassessment is that gas sectors across the world have been reformed in recent decades, mostly by moving from a vertically integrated state monopoly towards a competitive industry, with the exception of some segments that still display features of natural monopolies. In line with this, regulatory reform in natural gas industry involves promoting competition in the competitive segments of the industry, the development of a robust regime for access to the monopolistic elements, and structural separation between the competitive and non-competitive segments (OECD, 2000[14]). As we shall see below, these are all dimensions measured by the PMR indicator.

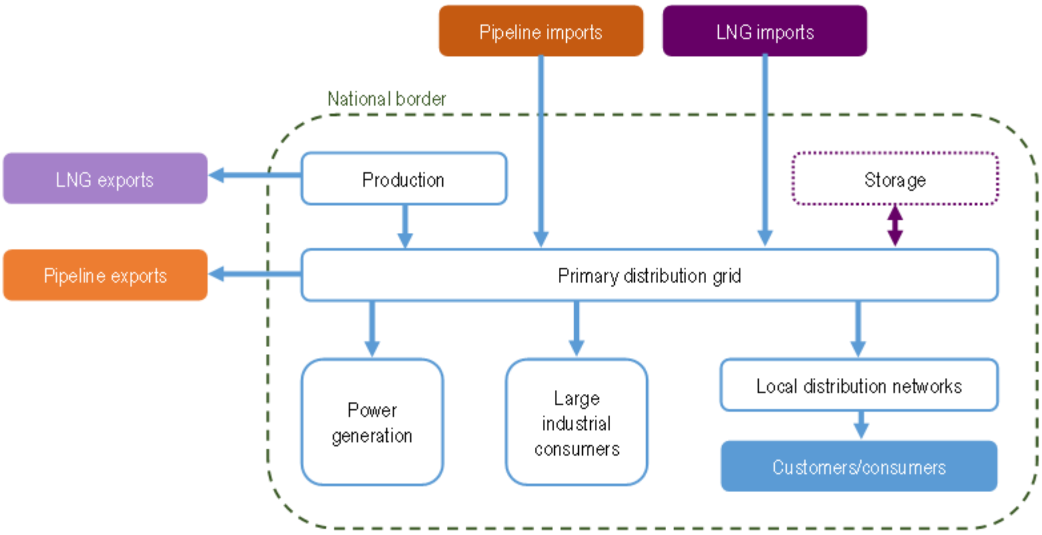
Empirical evidence on the effects of such regulatory reforms in public utilities and other sectors suggests that liberalisation has been, on the whole, beneficial for efficiency and consumer welfare, leading to better productive efficiency, increased quality of service and lower prices after reform. However, these beneficial effects have been sometimes bedevilled by regulatory flaws in the access regime to the monopolistic elements, the failure to curb the use of market power by incumbents in the competitive segments of the industries, and difficulties in addressing the complex technical issues that arise after basic entry liberalisation has been implemented (OECD, 2000, p. 155[12]).

In practice, liberalisation of the gas sector is a complex process that often takes years. As restrictions to entry in competitive segments are lifted, rules must be set to make access to the non-competitive segments by a plurality of service providers possible, non-discriminatory, and efficient. Consumers' ability to switch to new entrants must also be fostered by easing the process and ensure transparent information on retail prices and other contractual terms and conditions are easily available. Where liberalisation is matched by the separation of vertically integrated monopolies into several independent entities (so-called "unbundling"), markets have to be created *ex novo* to replace transactions that were previously taking place exclusively within a single firm. Where (non-economic) public interest objectives were previously pursued within a regulated non-competitive environment, regulators and police-makers must ensure that such objectives remain consistent with competition. Finally, in instances where firms are privatised or activities contracted out, regulation through public ownership must be replaced by effective arm's length regulation (OECD, 2000, p. 156[12]).

The liberalisation of the natural gas sector

The gas industry is composed by a number of segments, most notably, production, storage, transmission, distribution, and retailing (Figure 4).

Figure 4. A stylised depiction of the gas sector



Source: IEA, 2014.

This analysis focuses only on natural gas and does not consider liquefied petroleum gas (LPG), as the PMR indicators focus only on the former.

- Natural gas is usually transported from the wellhead – or, if relevant, the place where gas is imported over sea or the storage facility – to the point of consumption through high-pressure transmission and low-pressure distribution pipelines.
    - There are significant economies of scale in high-pressure transmission pipelines. As a result, the opportunities for competition between transmission pipelines depend on the geographic location of producers and consumers, and on the level of gas demand – and are typically limited. As a result, gas transmission is normally taken to have characteristics of a natural monopoly (and is treated as such in the PMR indicators[6]).
    - The local (low pressure) gas distribution network to smaller consumers also exhibits economies of scale and density. The scope for competition is strictly limited, hence local distribution networks are considered to have the characteristics of natural monopolies (and are treated as such in the PMR indicators)[7] (OECD, 2000, p. 8[14]).
- Natural gas can be temporarily stored, enabling flows over the pipeline network to be held relatively constant despite daily and seasonal fluctuations in gas demand. There is scope for competition in this segment, though the opportunities for effective *de facto* competition depend on the number of suitable sites for storing large quantities of gas, which varies from country to country (OECD, 2000, p. 8[14]).
- Companies active in retailing provide various services, such as negotiating with producers for supplies and with transmission and distribution operators for transport services. These companies

[6] This means that the fact that this segment of the industry is a legal monopoly does not lead to a negative score in the PMR indicator, as it would in the case of segments that could successfully be opened to competition.

[7] See previous footnote.

may also develop new contractual products and services which meet the demands of downstream users; and they may also provide a brokerage service, matching the supply and demand of gas customers in gas markets. The scope for competition in this market can be substantial (OECD, 2000, p. 8[14]).

In short, promoting competition in the natural gas industry hinges on the development of competition in the gas production, storage, and gas retail supply markets. Since the transmission and distribution segments are "natural monopoly" activities, these two activities need to be appropriately regulated to promote competition in the other segments, by ensuring non-discriminatory access by third parties at cost-oriented prices, and by providing them with incentives towards cost and productive efficiency (OECD, 2000, p. 8[14]; IEA, 2018[15]).

Hence competition in the gas sector can be enhanced primarily by: a) allowing final gas customers to choose their gas producer, and b) ensuring that the incumbent transmission and distribution networks do not discriminate between gas producers in setting prices and other terms and conditions of access to their pipelines. (OECD, 2000, pp. 33-34[14]).

The vertical separation or unbundling of those market segments with the characteristics of a natural monopoly (i.e. gas transmission and distribution) from those market segments where competition is possible (i.e. gas production, storage, and retail supply) is essential for the realisation of an efficient and competitive gas market. A transmission operator that is integrated upstream into gas production or downstream into gas retailing has a strong incentive to offer transportation services of a higher price or lower quality to rival producers or rival retailers, and to resist regulatory attempts that force it to offer non-discriminatory access.

Several models of unbundling are possible.

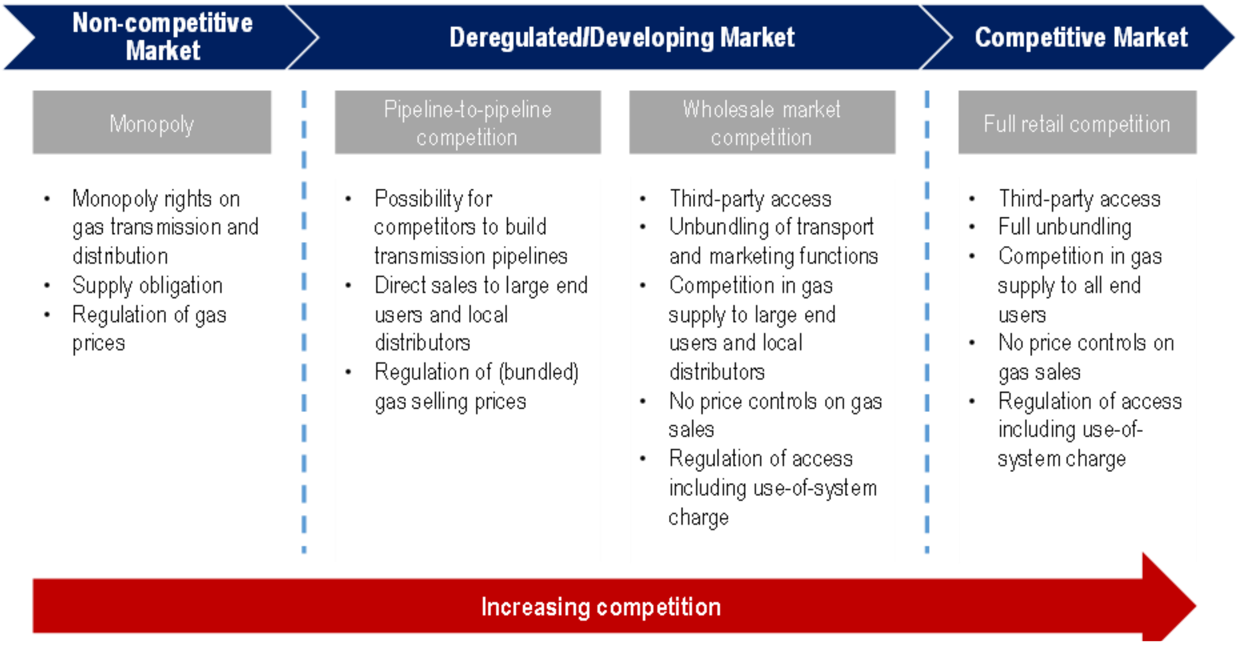
- Full ownership unbundling, involving the complete ownership separation of relevant companies across the various gas market segments.
- Legal or operational unbundling imply that the activities of the overall group of affiliated companies are and remain separated. This type of unbundling typically requires stronger regulatory oversight than full ownership unbundling.
- Finally, accounting separation means that a vertically integrated company must keep separate accounts for regulated and competitive market activities. This is the least stringent form of unbundling.

As described below, the scoring in the PMR indicator gives different scores depending on the levels of separation between transmission/distribution networks and companies active upstream and downstream. In particular, the more effective and transparent the unbundling model adopted the better the PMR indicator score, reflecting the smaller risks posed to competition in upstream and downstream markets.

Unbundling vertically integrated firms is a necessary condition to guarantee effective and non-discriminatory third-party access (TPA) to gas transmission and distribution networks (IEA, 2018, pp. 3, 21[15]).

As already noted above, transitioning from a vertically integrated, publicly owned gas supply chain to a competitive natural gas market is a complex process that must run through various stages (depicted in Figure 5) (OECD, 2000, p. 156[12]).

Figure 5. Transition from an integrated monopoly to a competitive market



Source: (IEA, 1998[16]).

This outlined reform process is the route that Brazil is currently taking.

The OECD PMR indicator and the gas sector in Brazil

The latest update of PMR indicators for Brazil and most OECD countries relies on information on laws and regulation in place on 1st January 2018.

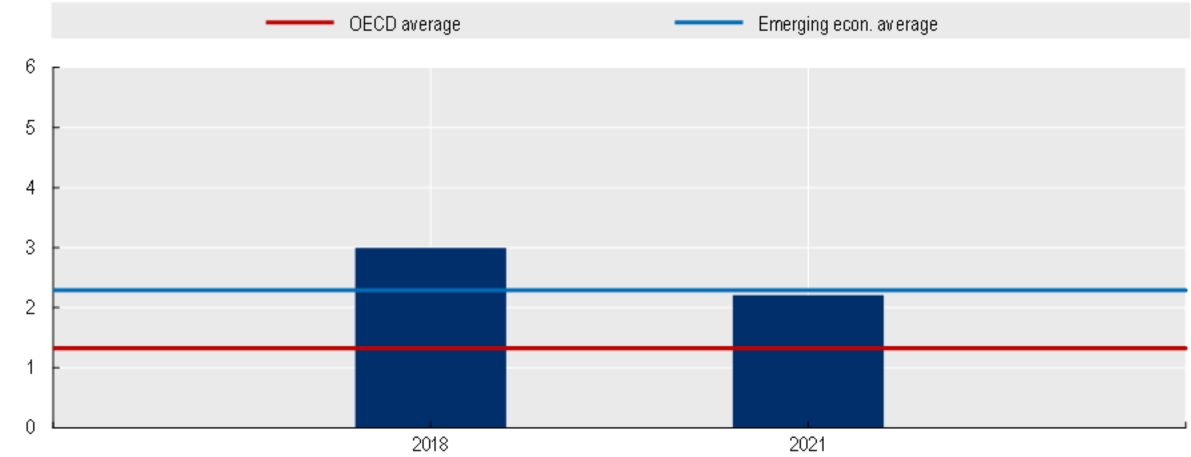
To support this paper the OECD has recalculated Brazil's PMR sector indicator for natural gas using information up to April 2021, including the New Gas Law[8]. Figure 6 compares the results of the 2018 PMR sector indicator for the gas industry with the 2021 revised value.

The figure shows that, as a result of the reforms undertaken thus far, Brazil's PMR sector indicator for the natural gas industry has improved substantially. Brazil's score is still higher than the OECD average, but the gap has reduced, and the country performs now better than the Emerging G20 economies average in 2018. However, further reforms are needed for Brazil's PMR indicator to converge towards the OECD average.

[8] It should also be noted that in Brazil, gas distribution and retail supply are under state jurisdiction, unlike upstream sectors which fall under the competence of the federal government. When elements of a network sector are regulated at state level rather than by the federal government, the PMR indicators refer to the legislation in force in a single state For Brazil, this is the state of São Paulo.

Figure 6. Brazil's PMR Sector indicator for Natural Gas before and after recent reforms

Scale 0 to 6 from most to least competition friendly regulatory framework



Note: The OECD average include all OECD member countries. Emerging G20 economies is the average of eight countries: Argentina, China, Indonesia, Mexico, Russia, South Africa, Türkiye, and Brazil itself. For most countries the indicators are based on laws and regulation in force on 1 January 2018, but for Costa Rica, Estonia, and the U.S. the information refers to 1 January 2019, and for Indonesia and China to 1 January 2020 as these 5 countries provided the data at a later date.
Source: OECD 2018 PMR database and data provided by Brazilian authorities for 2021 update.

The evolution of Brazil's gas sector

As noted above, opening gas markets to competition is a long and complex process that typically takes many years. While this paper focuses only on PMR indicators from 2018 and 2021, Brazil's efforts to promote a competitive market started earlier.

Regulatory framework

The natural gas market in Brazil has historically been controlled by the national oil company Petrobras. Until 1995, Petrobras enjoyed a constitutionally enshrined legal monopoly for the exploration, production, and transportation of hydrocarbons. The design of Brazil's gas sector was therefore in line with the traditional approach to gas markets, characterised by a vertically integrated structure under state ownership.

Reflecting the evolution in the role of the state in network sectors across the world in past decades, Brazil has long been moving away from a vertically integrated state monopoly and has been promoting the development of an effectively competitive industry. Following a constitutional reform,[9] the 1997 Petroleum Law – applicable to both oil and gas – sought to separate transportation activities from other market segments.[10] The law stopped short of introducing cross-ownership limitations, and Petrobras complied with the new legal requirements by setting up wholly-owned subsidiaries to own and operate transmission pipelines[11] (IEA, 2018, p. 15[15]). The absence of developments in Brazil's natural gas market following the 1997 reform led to the adoption of the 2009 Gas Law, which aimed, among other things, to create a concession regime for the transport of natural gas and to establish regulated access to the pipeline

[9] This monopoly was established in Brazil's Federal Constitution. A constitutional amendment in 1995 was therefore required to allow for the sector's liberalisation.

[10] Lei no. 9.478 de 6 de Agosto de 1997.

[11] Transportadora Associada de Gás S.A. (TAG), which owned the pipelines, and Transpetro, which operated them.

transport system.[12] Despite these reforms, Petrobras retained a *de facto* monopoly across the gas value chain.[13]

Another attempt at opening up the gas market was undertaken by means of the Gas to Grow Initiative in 2016 (see Table 2 for a summary of the changes proposed by the Initiative). As presented above, involving detailed studies and the development of strategic guidelines by the National Council for Energy Policy,[14] the Gas to Grow initiative developed a general framework for market integration of the gas sector in Brazil (IEA, 2018, pp. 23-25[15]). While some of the proposed measures were adopted,[15] those that required an act of Congress were not.[16]

As a result, a second attempt of reform was launched in 2019. As presented in the section on The new regulatory framework for the natural gas sector: its development, the *Novo Mercado de Gas* (New Gas Market) Programme culminated in April 2021 with the adoption of a New Gas Law, which included the significant reforms outlined in Table 3.[17] See also Box 2 for more information.

In short, the New Gas Law provides the legal framework for the transition from a vertically integrated structure to a liberalised and competitive market structure, based on four key principles:

- Unbundling: Gas network operators cannot be directly or indirectly controlled by companies involved in other activities along the gas value chain, including exploration, production, import or retail commercialisation.
- Third-party access: Market participants should be granted access, on a non-discriminatory basis, to transport pipelines under a regulated regime, and to gathering pipelines, processing plants and liquefied natural gas (LNG) terminals under a negotiated regime.
- Entry–exit transport system: Network users will be able to book entry and exit capacities independently from each other, enhancing the flexibility of the gas system. This entails a departure from the more rigid point-to-point system, wherein users reserve capacity at specific points along the contractual transportation route.
- Transparency: Network operators must provide market participants with operational transparency on available transport capacity and tariffs related to transport services (IEA, 2021[17]).

This reform is a major step in moving towards a competitive gas market in Brazil, and has contributed to the improvement of Brazil's PMR gas sector indicator.

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[12] Lei 11.909 de 4 de março de 2009.

[13] This could be explained by the specific design of certain key components necessary for a competitive market to develop that were set out in the 2009 Gas Law but never fully implemented. For example, the 2009 Gas Law established regulated third-party access to the transmission network but not to other facilities (such as upstream pipelines, processing facilities and LNG terminals). This made it virtually impossible for independent producers to access the gas transport infrastructure, and led them to sell their production to Petrobras.

[14] CNPE Resolution No. 10 de 14 de Dezembro de 2016.

[15] E.g. those related to Decreto nº 9.616, de 17 de dezembro de 2018, concerning the entry and exit model in the transport system.

[16] These proposals were consolidated, in 2017, into a draft bill presented before Congress in the form of a replacement for Bill (PL) No. 6.407/2013, later renumbered as PL No. 4.476/2020 (https://www.camara.leg.br/proposicoesWeb/fichadetramitacao?idProposicao=593065).

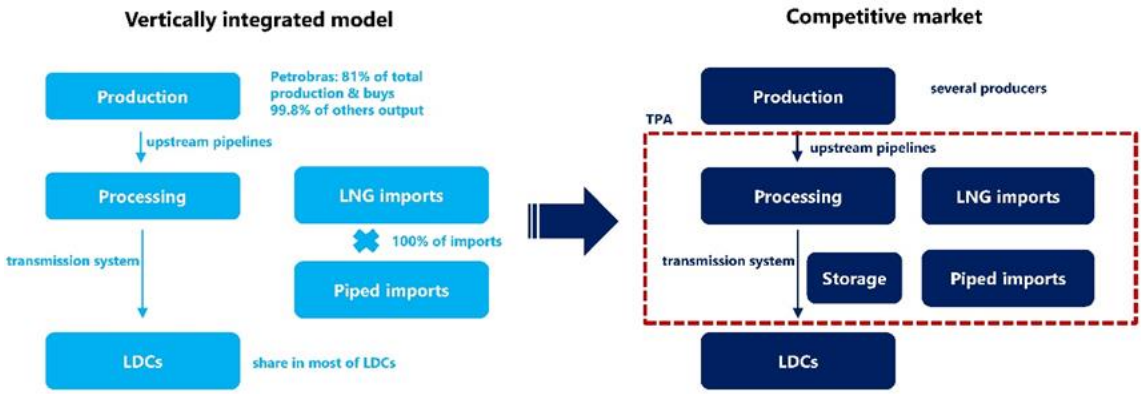
[17] Law No. 14.134, de 8 de abril 2021 (http://www.planalto.gov.br/ccivil_03/_ato2019-2022/2021/lei/L14134.htm). In addition, the Decree regulating this Law has already been implemented – see Decreto nº 10.712, de 2 de junho de 2021.

Table 3. Main Reforms of the New Gas Law (2021)

	Before the New Gas Law	After the New Gas Law
Gas Transport	Concession regime, subject to bidding process	Authorisation Procedure
Gas Transit Unbundling	Ownership separation only for new pipelines	Full Ownership Unbundling
Gas Transport System Expansion	Centralised decision-making by Government Ministry	Transmission system operators responsible for planning, subject to no-discrimination requirements and regulator's approval
Gas Storage	Concession regime, subject to bidding process	Authorisation Procedure
Access to Essential Infrastructures	No obligation to allow third-party access to pipelines, natural gas treatment, storage and processing facilities, or LNG terminals	Mandatory non-discriminatory negotiated access to pipelines, natural gas treatment, storage and processing facilities, or LNG terminals
Gas Distribution	No unbundling requirements	Gas companies subject to federal regulation must unbundle gas distribution companies subject to state-level regulation
Market Concentration	No mechanisms in place	The National Agency of Petroleum, Natural Gas and Biofuels (Agência Nacional do Petróleo, Gás Natural e Biocombustíveis – ANP)[18] should adopt mechanisms to encourage efficiency and competitiveness, and reduce concentration in the supply of natural gas, including the possibility of carrying out gas release programs and compulsory transfer of transport capacity

Source: Government of Brazil.

Figure 7. The impact of the new gas market programme on the natural gas sector



Source: IEA, Gergely Molnar (2020), Towards a New Gas Market in Brazil: Insights from European experience.

State ownership

To be effective, these regulatory efforts must be coupled with efforts to reduce the presence and role of Petrobras in Brazil's gas market to foster entry by private firms in competitive segments of the market. And, in effect, Petrobras' corporate group has been the subject of reforms leading to the privatisation and spinning-off of certain of its gas businesses, assets and subsidiaries.

This began in the 1990s, when Brazil went through a series of market reforms that promoted privatisation and affected Petrobras group's corporate structure. More recently, Petrobras has tried to reduce its indebtedness and cost of capital by divesting its non-core businesses. To settle investigations into alleged anticompetitive conduct, Petrobras has further accepted to divest important gas interests among other commitments. These divested businesses include on-shore and shallow waters assets in the oil and gas

[18] ANP is Brazil's federal regulator of the oil, gas and biofuels industry.

sector, gas production assets, refineries, thermoelectric generation assets, and subsidiaries involved in gas transportation and distribution[19] (OECD, 2020, p. 76[18]).

Taken together, the divestments carried out by Petrobras, and the establishment of new system operators who have been able to acquire parts of Brazil's gas transportation and distribution systems, are valuable contributions to the unbundling of the system (IEA, 2018, p. 5[15]), with positive implications for Brazil's PMR gas sector indicator score.

Despite all these efforts, Petrobras remains the main player across Brazil's gas sector. As of February 2018, 77% of Brazil's gas production came from fields operated by Petrobras (IEA, 2018, p. 83[15]). While almost 25% of all gas in Brazil is produced by companies other than Petrobras, those companies must still sell their gas to Petrobras, which is the sole company to sell gas into Brazil's wholesale market. In effect, around 97% of all gas volumes in the wholesale market were traded in 2021 on the basis of long-term contracts with Petrobras, although several producers have begun to supply LDCs directly in 2022 (ANP, 2022[19]). The existence of long-term bilateral contracts between Petrobras and all major distributors and large industrial consumers means that Petrobras has maintained a dominant influence in retail price formation across the country. Furthermore, Petrobras also held indirect stakes in 19 of the 27 local distribution companies through its natural gas distribution subsidiary Gaspetro, (IEA, 2018, pp. 4-5[15]). In 2022, Petrobras and Gaspetro completed the sale of Gasmar to another company, reducing the number of local distribution companies in which Petrobras has a stake from 19 to 18 . The landscape of ownership may change further in the future; Petrobras agreed to sell its shares in its natural gas distribution subsidiary Gaspetro, a sale under analysis by CADE at time of writing (Competition Policy International, 2022[20]).

In short, reforms over time, and in particular those adopted since 2018, have led Brazil's PMR gas sector indicator to improve. However, even with these initiatives the PMR indicator still shows that further reforms are needed.

The rest of this section looks at each constituent element of the PMR gas sector indicator in turn to highlight where reforms are still needed:

1. the level of public ownership;
2. the type and content of sectoral regulation, in particular:
    - Entry regulation, including information on third-party access;
    - Vertical unbundling of upstream and downstream markets from those market segments with natural monopoly characteristics – i.e. the gas transmission and distribution networks;
    - The existence of a liberalised wholesale market; and
    - Retail price regulation.

Analysing the status and progress of these categories provides insight on the current state of Brazil's gas sector reform, investigate how ongoing reforms influence Brazil's PMR gas sector indicator, and identify additional opportunities for pro-competitive reforms.

Public ownership and control

The PMR explores whether public authorities can directly influence market competition in each gas sector segment through their ownership and control of the conduct of companies in that segment.

[19] Most notably Transportadora Associada de Gás (TAG) and Nova Transportadora do Sudeste (NTS). Further divestments are planned but incomplete: sales processes for Petrobras stakes in Transportadora Brasileira Gasoduto Bolivia-Brasil S.A. (TBG) and Transportadora Sulbrasileira de Gás (TSB) are in process, and the sale of Petrobras Gás (Gaspetro) is still under analysis by CADE at time of writing (Reuters, 2021[28]; Competition Policy International, 2022[20]) (Reuters, 2021[28]; Competition Policy International, 2022[20]).

In particular, for each gas sector segment - gas production, import, transport, distribution and retail supply –[20]the PMR questionnaire explores whether the state holds equity stakes in the largest firm, and whether it controls or has special voting rights (e.g. golden shares) in at least one company in the relevant gas segment. In addition, the questionnaire explores whether that are constraints to privatising public companies in the relevant market segments.

Concerning the percentage of shares held by the federal or state governments in the largest firm in each segment, these are significant in all relevant segments with the exception of gas transmission and distribution. Public authorities hold a 50.5% stake of Petrobras, which is the largest company in the gas production, gas import, and gas retail supply segments.

In recent years, Petrobras has made significant divestments in the transmission sector. In the gas transmission sector, the largest operator is Transportadora Associada de Gás SA (TAG). Up until 2019, this company, which owns about 4,500 km of transmission pipelines (about 47% of Brazilian transmission network), was part of Petrobras' corporate group. However, in 2019 Petrobras concluded the divestment of 90% of the equity it held in TAG, before selling its outstanding equity in June 2020. The result is that TAG is now fully private.[21] In 2021, Petrobras also concluded the divestment of its remaining 10% equity it held in Nova Transportadora do Sudeste S.A (NTS), after having initiated the sale of 90% of its shares in 2017 (NTS, 2021[21]). NTS operates more than 2,000 km of pipelines, located in the states of Rio de Janeiro, Minas Gerais, and São Paulo (responsible for 50% of natural gas consumption in Brazil). It connects to the Brazil-Bolivia gas pipeline, to the TAG transport network, to the LNG regasification operations of the Guanabara Bay and the processing plants for natural gas produced in the Campos Basin and in the pre-salt of the Santos Basin (NTS, 2021[21]).

Concerning gas distribution, the situation is more varied since there are 27 distribution companies in different areas of the country. However, the largest gas distributor is Comgás, which is a privately-owned distributor operating in São Paulo.

In addition, federal and state governments still control at least one company in each relevant gas sector segment. This is not only the case in those segments where Petrobras is the largest company, but also in gas transmission and gas distribution.

In the transmission segment, Petrobras still holds a 51% stake in TBG – Transportadora Brasileira Bolivia-Brasil S.A., which owns and operates the 2,593 km Brazilian section of the Bolívia-Brazil gas pipeline. This may change in the near future, however, as Petrobras has entered into a commitment with the Brazilian competition authority to sell all its shares in transmission companies.

With regards to gas distribution, state involvement is still considerable (Table 4). Only nine out of the 27 distribution companies present in Brazil do not have Petrobras' corporate group as a shareholder. Of these, only two – both in São Paulo – are fully in private hands. Of the remaining six, BNDESPAR, a subsidiary of the Federal Government's Brazilian Development Bank, holds a sizable stake in one gas distributor in Rio de Janeiro; two other distributors are fully owned by state and local authorities; and state governments hold the majority stake in one gas distributor[22], and minority stakes in two gas distributors while the rest of equity is in private hands.

[20] In the case of Brazil the markets for gas storage and export are not considered given their small size.

[21] https://www.engie.com.br/en/press/press-releases/engie-and-cdpq-to-acquire-remaining-10-of-tag-in-brazil.

[22] This gas distributor, ESGAS, was fully under the control of a Petrobras subsidiary called BR Distribuidora until the end of 2018. Petrobras concluded the sale of all BR Distribuidora equity in this company in June 2021. Later on, in December 2021, the state of Espirito Santo passed a new law allowing the state government to divest its stake in the distribution company (Assembleia Legislativa Espírito Santo, 2021[25]).

Table 4. Gas Distribution Companies where Petrobras has a stake

	Federally owned investors	Petrobras equity stake	State equity stake	Private shareholders
Naturgy SP	-	-	-	99,99% - Naturgy Distribución Latinoamérica S.A 0,01% - Katia Brito Repsold
Comgas	-	-	-	99,14% - Compass Gás e Energia S.A. 0,86% - Free float
MTGás	-	-	Mato Grosso State	-
Gasmig	-	-	99,60% - Cemig (which is 50,97% owned by Minas Gerais State 0,40% - Belo Horizonte municipality	-
ESGás		-	51% - Espírito Santo State	49% - VibraEnergia (formerly BR Distribuidora)
Cigás	-	-	17% - Amazonas State	83% - Manausgás S.A.
Gas do Pará	-	-	25.5% - Pará State	74.5% - Termogás
CEG Naturgy	34,56% - BNDESPAR	-	-	54,16% - Naturgy Distribución Latinoamérica S.A. 8,84% - Fundo de Investimento em Ações Dinâmica Energia 2,26% - Pluspetrol Energy
Gasmar	-	-	25.5% - Maranhão State	74.5% - Termogás
Gas Brasiliano	-	100% - Gaspetro		-
Potigás	-	83% - Gaspetro	17% - Rio Grande do Norte State	-
MSGás	-	49 % - Gaspetro	51% - Mato Grosso do Sul State	-
Sulgás	-	49 % - Gaspetro	--	51% Compass Gás e Energia S.A.
Algás	-	41.5% - Gaspetro	17.0% - Alagoas State	41.5% - Mitsui Gas e Energia do Brasil
Bahiagás	-	41.5% - Gaspetro	17.0% - Bahia State	41.5% - Bahia Participações (Mitsui Group)
Cegás	-	41.5% - Gaspetro	17.0% - Ceará State	41.5% - Mitsui Gas e Energia do Brasil
Copergás	-	41.5% - Gaspetro	17.0% - Pernambuco State	41.5% - Mitsui Gas e Energia do Brasil
PBGás	-	41.5% - Gaspetro	17.0% - Paraíba State	41.5% - Mitsui Gas e Energia do Brasil
SCGás	-	41% - Gaspetro	17% - Celesc (a Santa Catarina State owned company	41% - Mitsui Gas e Energia do Brasil 1% - Infragás
Sergás	-	41.5% - Gaspetro	17.0% - Sergipe State	41.5% - Mitsui Gas e Energia do Brasil
Rongás	-	41.5% - Gaspetro	17.0% - Rondônia State	41.5% - Others
Gasap	-	37.25 % - Gaspetro	25.5% - Amapá State	37.25 % - Termogás
Gaspisa	-	37.25 % - Gaspetro	25.5% - Piauí State	37.25 % - Termogás
GoiasGás	-	30.5% - Gaspetro	17.0% - Goiás State	42.2% - Termogás 10.3% - free float
Compagás	-	24.5% - Gaspetro	51.0% - Copel (Paraná State owned company)	24.5% - Mitsui Gas e Energia do Brasil
CEBGás	-	32% - Gaspetro	17% - CEB – Companhia Energetica de Brasilia[23]	51% - Consórcio BrasiliaGás
CEG Rio (Naturgy)	-	37.4% - Gaspetro	-	59.6% - Grupo Gas Natural 3.0% - Pluspetrol Energy

Source: Brazil's Ministry of Economy.

[23] A stake of 80.2% in this company is held by the state government. See http://www.ceb.com.br/index.php/institucional-ceb-separator/estrutura-societaria-ceb.

Through its participation in Gaspetro, Petrobras[24] fully owns one distributor, holds a majority stake in another, and has a stake below 50% – which may nonetheless be the largest equity stake – in another 16 gas distribution companies, whose ownership is in some cases shared with state governments. It should be noted that Petrobras is likely to divest Gaspetro to fulfill the commitments it entered with Brazil's competition authority.[25] This will significantly diminish the level of state involvement in this market segment.[26]

The PMR indicator also evaluates whether there are legal or regulatory obstacles to the sale of state-owned equity stakes in gas companies. As with other privatisation initiatives, the divestment of public or mixed-capital gas companies requires legislative authorisation when these companies are held by the federal government; furthermore, if the relevant company was created by law, an additional law is required for the government to divest its interests in it. Instead, the sale of subsidiaries does not require legislative intervention.

Finally, there are no golden shares or other special voting rights held by federal or state governments in any company active in the gas sector.

The gas industry's key players at all levels of the market use to be fully state-owned. The market has witnessed some liberalisation, but the state still plays a major role across all segments of the gas sector. While this causes Brazil's PMR sector indicator to be high when it comes to state ownership (see Figure 6), efforts to liberalise market segments, and to have Petrobras divest its operations in certain segments, have contributed, and are likely to continue to contribute to an improvement in Brazil's performance under this indicator. Given this, Brazil may want to continue divesting Petrobras' various interests in the gas sector.

Entry regulation

The move from a vertically integrated state monopoly to an effectively competitive industry requires a regulatory framework that allows new and more efficient firms to enter, and consumers to easily switch towards those firms that offer better deals (i.e. lower prices, better quality, more innovative services). The PMR indicator assesses whether the key elements of such a regulatory framework are in place.

Conditions that are widely acknowledged as necessary for effective entry to occur, and which are reflected in the questionnaire, include: the absence of rules restricting the number of firms that might enter into those segments of the gas supply chain that are not natural monopolies (i.e. the transmission and distribution grids); the existence of third party access terms to the transmission and distribution grids that are set by an independent regulator; the existence of a wholesale market for gas; the ability of final consumers to switch gas suppliers; lack of retail price regulation in those segments where competition is effective; and the obligation on retailers to provide clear information to their customers on their annual consumption and on retail tariffs they are charged in their bills.

In Brazil, those segments of the market that are not natural monopolies have been opened up to competition, with the exclusion of the retail supply markets as in most states eligibility to become a "free consumer" (i.e., a consumer who can switch retail suppliers) is based on consumption volumes and, as a result, small commercial and domestic users cannot choose their providers. For example, in the states of Rio de Janeiro and Bahia, free consumers are only those with a minimum average daily consumption of over 10,000 m^3 per day, and in Amazonas, those with a minimum monthly consumption over 300,000 m^3;

[24] Petrobras holds 51% of Gaspetro. The remaining 49% are held by Mitsui Gás e Energia do Brasil Ltd.

[25] https://www.gov.br/cade/en/matters/news/cade-extends-deadlines-for-petrobras-asset-sale-in-oil-refining-and-natural-gas-markets.

[26] If this process is completed by the end of 2022, it will be show in Brazil's PMR scores in the forthcoming 2023 vintage.

and in São Paulo, the local distribution company's concession contracts provide the supplier with the exclusive right to provide gas to residential and commercial consumers.[27] This may be the result of long-term exclusive concession contracts entered into with gas distributors, despite the law generically providing for the possibility of retail customers choosing their supplier.[28] However, the result is that many consumers are not able to choose their supplier, and that concessionaires effectively enjoy local monopolies. Since retail supply markets are regulated at state level, a concerted effort is required to ensure that all state regulators take the steps necessary to harmonise retail regulation between states and permit the development of effective competition for all gas consumers.

On the other hand, there are no restrictions on the number of firms allowed to operate in other gas sector segments, and terms and conditions for third-party access to the gas transmission grid and to gas distribution network are regulated.

Finally, a wholesale gas market exists in Brazil. However, it should be noted that there remain practical obstacles to this market's liquidity and to third-party entry (see Box 4).

While Brazil has been adopting reforms to promote market entry, particularly with regards to access to the gas transmission and distribution networks, obstacles remain at the state level for companies that wish to supply certain categories of final consumers. Restrictions to entry for retail suppliers should continue to be removed in order to favour competition in the retail market. Harmonising gas trade and the operation of gas infrastructure, including between states, may allow gas retailers to supply gas across state borders. Ultimately, all retail consumers should be free to select their retail supplier regardless of consumption volume.

Box 4. The making of a wholesale market in Brazil, insights from the IEA

The wholesale gas market allows network users to trade gas bilaterally or through an exchange. Although the PMR indicator considers whether a wholesale gas market exists, but does not assess its specific characteristics, the health of wholesale gas markets is important. A well-functioning wholesale market can bring about a range of benefits, including promoting competition between suppliers, enabling transparent price discovery, and improving the efficiency of resource allocation (IEA, 2020[22]).

A wholesale market exists in Brazil, but there are opportunities to make this market more liquid, transparent and competitive. Brazil's New Gas Market takes important steps in this direction, envisioning the creation of interconnected entry-exit zones with "virtual trading points" allowing free trading between and within zones (IEA, 2021[17]).

In its review of the natural gas market in Brazil (*Towards a competitive natural gas market in Brazil: A review of the opening of the natural gas transmission system in Brazil)* (IEA, 2018[15])) and in the subsequent white paper (*Implementing Gas Market Reform in Brazil: Insights from European experience)* (IEA, 2021[23])), the IEA provides additional insights on how to create a better-functioning wholesale market in Brazil. Their key suggestions include:

[27] Please note that, to the extent that as gas retail is subject to state regulation, the PMR indicators only reflect the situation in the State of Sao Paulo as this is Brazil's representative state for the purposes of the PMR indicators. The Brazilian Ministry of Economy and the Ministry of Mines and Energy provided additional information about other states.

[28] E.g. Article 28 of Deliberation 1061/2020 of 6 November 2020, of the *Agência Reguladora de Serviços Públicos do Estado de São Paulo – ARSESP* (Public Services Regulatory Agency of São Paulo State). However, this same deliberation provided (see Art. 1, § 2) that it is necessary to respect the terms of the concession contract for the supply to users in the residential and commercial segments. We understand that some of the relevant concession contracts run until 2029, and that this restriction will remain in place until then.

- Hub-based gas prices should replace oil indexation, currently the norm in Brazil, which better reflects supply-and-demand dynamics of the market.
- Network codes that create clear common rules should be adopted.
- Trading activity should be subject to market monitoring and supervision, allowing authorities to detect anticompetitive behaviours and build trust among participants.

A supporting factor for a more effective wholesale market is the development of well-functioning hubs, or marketplaces where market participants exchange natural gas. Hubs can be physical, a geographic point where participants trade physical volumes, or virtual, where participants can trade regardless of the location of physical volumes in the system. A "liquid" hub that is matches demand with offers from market participants in an efficient way. Drawing inspiration from the European gas market model, the IEA outlines the conditions that could ensure the development of liquid hubs in Brazil. These include a transmission system that is able to meet demand requirements, a regulatory framework that enhances midstream flexibility (including unbundling and ensuring third-party access, among other factors), and a hub design that allows for the development of trading (including non-discriminatory access, transparent licensing, and appropriate participation fees) (IEA, 2021[23]).

Sources: (IEA, 2018[15]), (IEA, 2020[22]), (IEA, 2021[17]), (IEA, 2021[23]).

Vertical integration

As noted above, the separation of gas transmission and distribution, on the one hand, from gas exploration, production and retail trade, on the other, is essential for efficient, competitive and well-functioning gas markets to develop and operate. The level of separation can differ vastly, however, which can significantly impact the operation of gas markets.

In light of this, the PMR gas sector indicator considers whether and how each gas segment is vertically unbundled from the gas transmission and distribution systems. Different unbundling models are evaluated by the PMR indicator by reference to the level of actual separation they guarantee.

Recent developments in Brazil have reinforced the level of vertical unbundling in the gas sector. The 2021 New Gas Law requires both full ownership separation between the gas transmission operator and all other companies active in other segments of the gas market; and operational separation between gas generation and import companies from gas distribution companies. The introduction of these requirements has improved Brazil's results in the PMR gas sector indicator.

To derive the full benefits of these reforms, it is crucial that these requirements are effectively implemented over the coming years. At the moment, they have not been fully implemented, and a long transition stage is planned. In particular, the New Gas Law requires new transmission companies to be fully separated from those operating in upstream and downstream market segments, while existing transmission companies merely need to achieve legal and operational autonomy, which can be demonstrated through a certificate of independence and autonomy issued by the regulator. The latter of which companies have to implement full ownership unbundling only by 2039. In practice, however, the unbundling process is well underway – with much of the transmission network fully unbundled or currently engaging in divestment proceedings. Hence, the process may be completed earlier.[29]

[29] It should be noted that since the PMR indicators assess the de jure regulatory framework; even if full unbundling was achieved earlier it would not affect the PMR indicator score.

Retail price regulation

In a market that is effectively competitive, firms set their own prices and consumers choose the providers that offer the best deal. Key to effective competition at the retail level is that customers are able to choose their supplier, a condition that, at present, is restricted.

When consumers are not free to choose their provider, retail price regulation is necessary to protect them. In Brazil, the retail supply market is regulated at state level and state regulatory authorities regulate retail prices for each category of consumers who are not eligible to switch suppliers. The methodologies used to set these prices vary across states. Some states such as Amazonas and Bahia, use a cost-plus approach which passes through gas acquisition costs, while other states, such as Rio de Janeiro, São Paulo, Minas Gerais, and Espírito Santo, use a price cap methodology.[30]

As discussed previously, not all consumers are yet able to switch providers, hence retail price regulation should be adapted to the relevant market conditions. This involves maintaining retail price regulation that fosters efficient entry for small commercial and domestic gas users as a stopgap measure until retail competition becomes effective, at which point retail price regulation should be removed. Disclosure requirements on consumption and rates can improve transparency and facilitate switching.

Even where customers are able to choose their supplier, competition cannot develop unless consumers have the information to be able to understand the available options and choose the best one. If consumers do not have this information, they will not exploit their ability to switch providers and suppliers will not be provided with the incentives to compete effectively, thus preventing competition from developing. Hence, consumers should be provided with sufficient information by retail gas providers. At a minimum this should include a clear indication of their annual consumption, and the retail tariffs they are charged.

The state of São Paulo, which is the one whose laws and regulations are reflected in the PMR indicator, requires that the bills issued to residential and small commercial customers provide this information[31]. This has a positive impact on the PMR indicator for the gas industry. However, this is not the case across all the states in Brazil: consumers in all states could benefit from a similar degree of transparency.

Areas for improvement and insights for policy reform

The PMR indicator provides insights on measures that Brazil may want to consider as part the ongoing reform of its gas sector. In recent years, Brazil has made important strides in reducing the level of public involvement in the sector, promoting market entry, and enhancing competition in numerous segments of the natural gas industry. Additional steps that Brazil could contemplate involve:

- Further divesting Petrobras' various gas interests, building on Brazil's significant early efforts to liberalise the sector and, in line with Petrobras' agreement with the Brazilian competition authority, to divest assets in transportation and distribution.
- Pursuing full ownership separation of gas distribution from gas generation and import companies – current requirements are limited to operational separation.
- Continue pursuing full ownership separation between existing gas transmission companies and all other companies active in the gas market, which is already well underway.
- Implementing the suggestions put forward by the IEA in its two reports on the Brazil gas market (IEA, 2018[15]; IEA, 2021[23]) to foster the development of a liquid and efficient wholesale gas market.

[30] According to information provided by the Brazilian Ministry of Economy and the Ministry of Mines and Energy.

[31] Article 53 of the Deliberation ARSESP No. 732.

- Allowing all consumers in all states, regardless of their consumption volume, to choose their retail suppliers, and, when competition becomes effective, liberalising retail tariffs.
- Ensuring that all consumers are provided with the information necessary for them to understand the terms and conditions they are subject to in their annual bill, which may entail furthering common transparency requirements across states.
- Further harmonising regulatory frameworks between states,[32] to facilitate the development of effective competition across borders.

[32] Taking into account the responsibilities and competencies of the states concerning gas infrastructure, a mechanism to coordinate or harmonise access and operational security terms and conditions for federal and state level infrastructure may eventually be required (IEA, 2018, pp. 6, 8[15]).

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