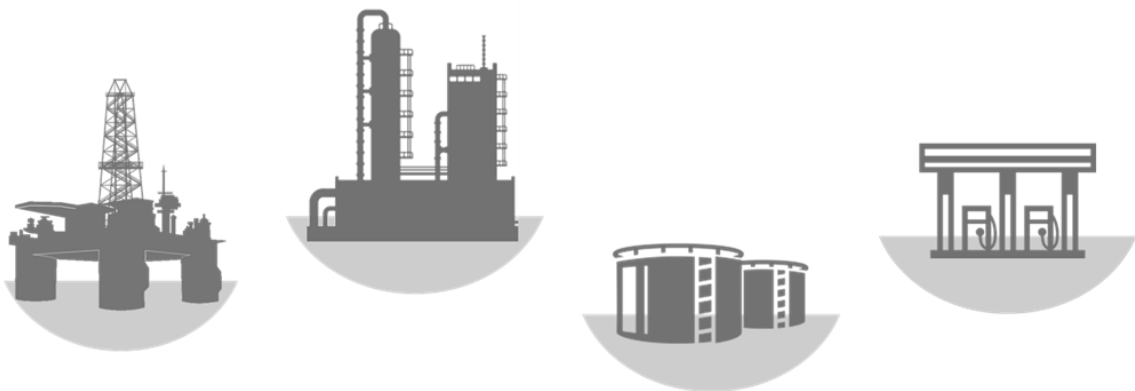




BRAZILIAN OIL & GAS REPORT

2019/2020

TRENDS AND RECENT DEVELOPMENTS



December 2020
Rio de Janeiro, Brazil



Empresa de Pesquisa Energética (EPE), or Energy Research Office, is a government-owned entity, attached to the Brazilian Ministry of Mines and Energy. The purpose of EPE is to provide energy information, studies and research that support the planning of the national energy sector.

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Acknowledgements

This report was prepared in the Oil, Gas and Biofuels Studies Division of the Energy Research Office (EPE), under the Direction of Heloisa Borges Bastos Esteves.

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This report was based on, among others, analyses performed for the International Petroleum Industry Report (*Boletim de Conjuntura da Indústria do Petróleo*), published biannually in Portuguese.

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List of Abbreviations

ANP – National Agency of Petroleum, Gas and Biofuels (Agência Nacional do Petróleo, Gás e Biocombustíveis)
BidSIM – Program for the Improvement of Tenders for the Oil and Natural Gas Exploration and Production (Programa para Aprimoramento das Licitações de Exploração e Produção de Petróleo e Gás Natural)
BNDES – Brazilian Development Bank (Banco Nacional de Desenvolvimento Econômico e Social)
boe/d – barrels of oil equivalent per day
b/d – barrels per day
CADE – Administrative Council for Economic Defense (Conselho Administrativo de Defesa Econômica)
CBIO – Decarbonization Credit (Crédito de Descarbonização por Biocombustíveis)
CNODC – CNPC Exploration & Development Company
CNPC – China National Petroleum Corporation
CNPE – National Energy Policy Council (Conselho Nacional de Política Energética)
E&P – Exploration and Production
EPE – Energy Research Office (Empresa de Pesquisa Energética)
FOB – Free on board
FPSO – Floating Production Storage and Offloading Unit
Ibama – Environmental Institute (Instituto Brasileiro do Meio Ambiente e dos Recursos Renováveis)
IEC – Integrated Energy Company
IOC – International Oil Company
LDC – Local Distribution Company
LPG – Liquefied Petroleum Gas
LUBNOR – Lubrificantes e Derivados do Nordeste Refinery
MME – Ministry of Mines and Energy (Ministério de Minas e Energia)
NGM – New Gas Market (Novo Mercado de Gás)
NTS – Nova Transportadora do Sudeste
PPSA – Pré-Sal Petróleo S.A.
PSA – Production Sharing Agreement
Refap – Alberto Pasqualini Refinery
Regap – Gabriel Passos Refinery
Reman – Isaac Sabbá Refinery
Repar – Presidente Getúlio Vargas Refinery
Replan – Paulínia Refinery
RLAM – Landulpho Alves Refinery
RPCC – Clara Camarão Refinery
RNEST – Abreu e Lima Refinery
SIX – Shale Industrialization Unit (Unidade de Industrialização do Xisto)
TAG – Transportadora Associada de Gás
TBG – Transportadora Brasileira Gasoduto Bolívia-Brasil
TCC – Term of Commitment for Termination of Practice (Termo de Compromisso de Cessação)
ToR – Transfer-of-Rights (Cessão Onerosa)
YPFB – Yacimientos Petrolíferos Fiscales Bolivianos

Introduction

The Brazilian Oil & Gas Report is an annual publication, whose purpose is to outline the sector's trends and developments from July 2019 to June 2020. Facts that happened after June 2020 will not be focus of this report.

Despite a challenging international market environment, Brazil's oil and gas industry remains on track to accomplishing its potential to become a major global player. This industry's prospects improved considerably over the second half of 2019, with oil production reaching new highs, considerable interest in oil field bidding rounds, and initiatives to open up the mid and downstream sectors helping attract investments. The breakout of the global Covid-19 pandemic did temporarily dim expectations, but relatively low development costs and interest in the medium sour barrels and low-Sulphur fuel oil produced from pre-salt streams allowed the country to quickly ramp up production again.

Brazilian upstream kept breaking records. Well productivity records and new FPSOs ramping up quickly to work at capacity allowed domestic production to reach new highs. The pandemic did force a temporary reduction in production, and led to the closure of some mature fields. New licensing round had to be postponed. And there were delays in the construction of items such as new FPSOs. This will have impacts on the production in the middle term. Those delays have not dimmed expectations for the upstream sector though. A series of successful licensing rounds in the past few years, in addition to declining costs in the pre-salt, and investments already committed, should guarantee a considerable boost in production over the next years. The fallout from the pandemic did affect long-term oil and gas production forecast for the country. However, oil and gas production is still expected to rise from 3.8 million boe/d in 2019 to 6.8 million boe/d in 2030.

The country's midstream also underwent significant changes. New models for contracting capacity in natural gas transmission pipelines were introduced. State-level regulatory frameworks that affected local distribution companies (LDC) were also reformulated. All of these actions are in line with the New Gas Market (NGM) program, a federal government initiative that aims at promoting a more diversified and competitive natural gas sector in Brazil. A Committee established to oversee the program has also been tasked with monitoring Petrobras' divestment plan regarding natural gas infrastructure. The Brazilian Antitrust authority (CADE) signed an agreement with the state-owned company, in which it pledged to sale considerable portions of its assets. These developments intend to promote a new competitive market to form in natural gas.

The oil sector's mid- and downstream is also undergoing changes. Half of Petrobras' refinery capacity is being offered for sale. This is also the result of an agreement between the company and the antitrust regulator. These sales are expected to stimulate other market participants to invest in new maritime terminals, pipelines and railways. This investment is needed to support Brazil's growing fuel demand, as per capita income increases.

The pandemic hit fuel demand especially hard. Demand for jet fuel dropped over 80%, and for ethanol and gasoline almost 40%. The decline and change in fuel mix forced some refineries to reduce their utilization rates significantly. However, the modest reduction in diesel demand, in addition to a relatively rapid return of gasoline consumption, and an increasing demand for international low-Sulphur fuel oil allowed refineries to ramp up production again.

Economic activity is expected to keep recovering over time, as business operations normalize and travel restrictions ease. The pandemic will likely have long-lasting effects on many sectors. However, Brazil's oil and gas industry is not expected to be affected in the long term, because of prolific oil and gas reserves, declining exploration costs and increasing domestic demand, as per capita income and wealth distribution increases. These factors, combined with a more competitive and investor-friendly market and regulations, should allow existing prospects for the country's oil and gas industry to materialize.

This report brings an overview of Brazilian oil and gas industry and addresses both the upstream and mid-downstream, including licensing rounds, mature fields, investments, government initiatives and infrastructure projects.

Upstream

Throughout 2019 and the beginning of 2020, the Brazilian Oil and Gas sector reached a record high production of 4,0 million boe/d in January (3,2 million b/d of oil and 138 million m³/d of natural gas). 2020s first quarter average oil and gas production was 3,8 million boe/d, 590 thousand boe/d higher than for the same period in 2019 (ANP, 2020a). The second half of 2019 was positive for the Exploration and Production (E&P) segment. Successful licensing rounds were able to lock in investments in major offshore development regions, but also in less prolific but more job-intensive onshore regions. In September, the government got 33 bids for exploratory blocks in the offshore basin of Sergipe-Alagoas and the onshore basins of Parnaíba, Potiguar and Recôncavo. Areas with non-conventional deposits were also sold in the onshore basins of Potiguar, Sergipe-Alagoas, Recôncavo and Espírito Santo. This first cycle of the Open Acreage consists of the permanent offer of relinquished fields. A summary of the recent licensing rounds is shown in Figure 1.

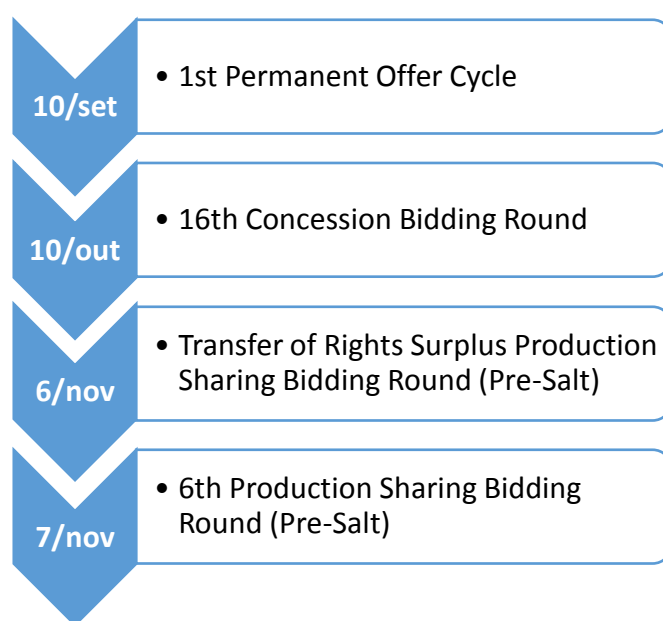


Figure 1 – Summary of Brazilian licensing rounds in 2019

Source: Adapted from ANP (2020b)

The 16th Concession Round was held in October, receiving bids for the most important blocks on offer in the Campos and Santos Basin, the heartland of Brazilian oil production. Signing bonuses generated US\$ 1,7 billion and exploratory investments were estimated at US\$ 0.3 billion. The offer attracted interest from all major International Oil Companies (IOCs), with winning bids going to Petrobras, BP, Equinor, Petronas, Chevron, ExxonMobil and Shell, among others.

The most coveted licensing round, and in the works since 2010, with proven reserves in the range of 6 to 15 billion barrels of oil equivalent, was the Production Sharing Bidding Round for surplus volumes to those contracted under the Transfer-of-Rights regime (ToR) (ANP, 2019a). The fields on offer were Atapu, Búzios, Itapu and Sépia. However, Petrobras had only been granted the right to produce 5 billion boe, 3.1 billion boe of which in Búzios. That field alone had more than 10 billion in proven reserves, 54 drilled wells, and was already producing upwards of 400 thousand b/d of oil with four Floating Production Storage and Offloading units (FPSO) in place (MARINHA, 2019). The possibility of buying into an extensively explored area, with oil wells, infrastructure, and FPSOs in place or on order, drove up the bidding price to US\$ 27 billion (ANP, 2019b), the most expensive bidding round in history (FIRJAN, 2019).

Despite the price tag, IOCs signed up for the tender and demonstrated interest in buying into the fields. Notwithstanding, only one offer was made for Búzios, and one for Itapu. Even though the Brazilian Government had reached a deal in which it reimbursed Petrobras for the investments it had made, the total cost of winning a bid was unknown. The winners of the licensing rounds would have had to negotiate with Petrobras to also reimburse it for already realized investments, since Petrobras already had a stake on a share of the total production. The day after the ToR surplus round only one of five blocks put on offer received bids in the 6th Production Sharing Contract (PSC) Bidding Round. Table 1 summarizes the results for both rounds.

Table 1 – Areas awarded in the ToR surplus Bidding Round and 6th Production Sharing Round

Area	Signing Bonus	Profit Oil	Consortium
Búzios	US\$ 12.9 billion (R\$ 68.2 billion)	23.24%	Petrobras (90%)*; CNODC (5%), CNOOC (5%)
Itapu	US\$ 0.3 billion (R\$ 1.8 billion)	18.15%	Petrobras (100%)*
Aram	US\$ 1.0 billion (R\$ 5.1 billion)	29.96%	Petrobras (80%)*, CNODC (20%)

Source: ANP (2019b)

Note: * denotes the operator.

With only one offer being submitted for Búzios, Itapu and Aram, the bid for those areas did not increase the minimal profit oil stipulated by ANP. The difference to the 5th PSC Bidding Round held in 2018 is significant. In the latter, all four blocks were awarded, and the profit oil promised by companies was bid up significantly. However, signing bonuses were also significantly lower in 2018, leaving room for companies to bid up the profit oil (ANP, 2020c).

The Surplus ToR Round could have raised about US\$ 20 billion if all areas had been awarded. Even though two areas went unawarded the public sale raked up the biggest signing bonuses ever paid for an exploratory area worldwide (US\$ 13 billion). Shortly after the round, Petrobras increased its development plan, announcing up to 10 platforms on the Búzios field alone (PETROBRAS, 2019a).

In order to increase the attractiveness of the remaining non-awarded ToR fields of Atapu and Sépia, the government decided that the compensation for the incurred development costs in partially developed fields should be completed before new tenders of these areas. PPSA the state-owned entity responsible for controlling the government's stake in PSC's, was imbued the responsibility to negotiate investment compensation with Petrobras ahead of new tenders. This should reduce uncertainty among participants and increase interest in presenting bids in upcoming lease sales (PPSA, 2020a).

In order to stimulate the E&P segment, the National Energy Policy Council (CNPE) created a program do revitalize activity on onshore fields (REATE 2020)¹. A program specifically designed to improve oil and gas bidding rounds was also created (BidSIM²).

Many significant offshore blocks have been awarded for the past few years, especially since 2015. These resulted in the start-up of several production units in the period. Petrobras started production from platforms P-67 in Lula field, as well as P-76 and P-77 in Búzios field in the first half of 2019, with the ramp-up of these platforms continuing over the rest of 2019 and beginning of 2020, each with a crude oil production capacity of 150 thousand b/d (PETROBRAS, 2020a).

The start-up of FPSOs was the main factor responsible for the growth in pre-salt output, leading the domestic oil production to reach a record high in January 2020. This record has been achieved in spite of a continuing decline in the mature Campos basin, as is represented in Figure 2. The recent results in exploration and domestic oil production are, in part, due to the large reservoirs and the high productivity of the pre-salt oil fields. Santos Basin's production relies on oil flow rate per well above the global oil industry's average³. Increased productivity requires fewer wells per production system, reducing costs. New technologies also helped to reduce development costs.

¹ The program REATE 2020 proposed several regulatory changes aimed at revitalizing onshore E&P activity. One of these recommendations that was already implemented by CNPE was the reduction in royalties from 10% to 5%. This reduction is granted to small and mid-size companies, in order to allow them to invest more (MME, 2020a).

² In order to increase the competitiveness and attractiveness of the areas to be offered in future bidding rounds, the Federal Decree nº 10,320/2020 instituted the Program for the Improvement of Tenders for the Oil and Natural Gas Exploration and Production of - BidSIM.

³ Sixteen wells of the Pre-salt Region produced over 35 thousand boe/d in Jan 2020, before the pandemic effects. In June 2020, that number dropped to eight (ANP, 2020d). According to Petrobras (2015), the average productivity in the North Sea and Gulf of Mexico reaches 10 thousand to 15 thousand b/d per well.

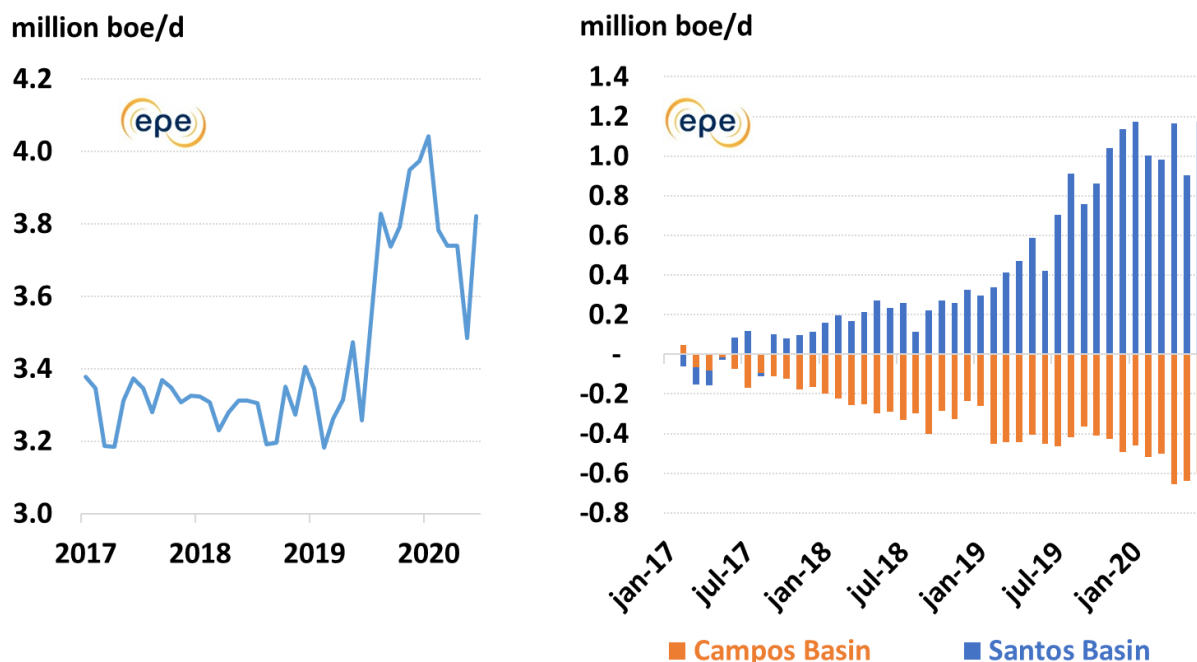


Figure 2 - National oil & gas production and accumulated monthly output change in Campos and Santos Basins since January 2017

Source: Data from ANP (2020d)

Pre-salt production, which is already responsible for over 70% of the country's production (ANP, 2020d), should continue gaining ground. In its new strategic plan, Petrobras announced it was repositioning its portfolio to focus on deep and ultradeep waters. By the end of 2019, the company announced 13 FPSO's and US\$ 64 billion in investments in E&P up to 2024 (PETROBRAS, 2019b)⁴.

⁴Petrobras did update its investment plan in September, cutting its upstream Capex from US\$ 64 billion for the 2020-2024, to between US\$ 40 billion and 50 billion for the 2021-2025. The company has confirmed Búzios alone will have 12 FPSO's and will reach a peak oil production of 2 million b/d. (PETROBRAS, 2020b). For the country as a whole, the government updated its official long term forecasts in September. Oil production is forecast to reach 5.26 million b/d, and natural gas production 261 million m³/d in 2030. However, these announcements happened outside of the timeframe of this study (EPE, 2020b).

According its financial expansion strategy, and to increase the robustness of its cash flow in a low price scenario, Petrobras has accelerated its divestment plan. The company has continued to sell assets located onshore and in shallow waters, announcing teasers or the signature of contracts in producing areas in states such as Rio Grande do Norte, Bahia, Alagoas, Ceará and Espírito Santo (EPE, 2020a). The sale of mature fields is expected to attract companies focused on these assets, which could improve recovery rates, stem the decline rates of these fields, and maybe even reverse the negative trend⁵. Recovery rates in Brazil lag behind the global average of 35%. The average rate for Campos Basin is 24%, while Norway's rate is closer to 50% (ANP, 2018a).

The Covid-19 pandemic hit the global oil market particularly hard in 2020, with Brent prices reaching US\$ 19,50/b on April 21st (OIPRICE, 2020). The effects on the Brazilian oil production can be seen in Figure 2. Losses in the Campos basin accelerated, while recent gains in the pre-salt were reversed. Reductions in local demand and in refinery runs, combined with decreases in demand globally, and the fear of oil storage worldwide reaching its limits led operators in Brazil promote output cuts⁶ (PETROBRAS, 2020e).

Oil and gas production bottomed out in May at 3,48 million boe/d. The accelerated declines in the Campos Basin from April are consequence of the hibernation of 62 shallow water platforms. The closure of a few production units due to the spread of Covid-19 also precipitated this decline (PETROBRAS 2020b; PETROBRAS 2020f). Local companies had to focus on their cash flows, and therefore anticipated scheduled maintenance stops and interrupted the operation of less profitable assets. Investment plans were also reevaluated. Petrobras, for one, cut its 2020 Capex by US\$ 3,5 billion, to US\$ 8,5 billion. This was achieved by postponing investments in exploration, well interconnection and refining. However, this reduction was also caused by a depreciation of the Brazilian currency (Real), which lost 37% of its value to the US dollar from December 2019 to May 2020 (BCB, 2020).

⁵ The Azulão gas field in the state of Amazonas is one such example. The field was sold in January 2019, which led to the development of the field, with first gas forecast for 2021. Another example are the onshore fields in the state of Rio Grande do Norte sold in December 2019. Their production has already increased since the transfer of rights. Another example is the Pampo and Enchova fields in the Campos basin. (MME, 2020b)

⁶ Petrobras announced cuts of over 300 thousand b/d in its oil production in the beginning of April. However, as exports increased, the company reversed some of these cuts before the end of the month. (PETROBRAS, 2020c) (PETROBRAS, 2020d)

Production recovered quickly to 3,82 million boe/d in June. This is still below the record 4,0 million boe/d from January, but demonstrates the robustness of the Brazilian E&P sector. This was supported by the Chinese economic recovery, which permitted surplus oil to be exported⁷. Petrobras alone exported 1 million b/d of oil in April. The previous record had been 771 thousand b/d in December 2019. (PETROBRAS, 2020g)

The licensing rounds scheduled for 2020 were delayed. However, these have already been rescheduled for 2021 and 2022, including the surplus ToR blocks, that should be put on offer in a new bidding round (MME, 2020a). In spite of the pandemic, the PSA contracts of Búzios, Itapu and Aram were signed. New discoveries were also announced, with extended well tests being conducted in the state of Sergipe, and oil deposits being discovered in the Saturno and Gato do Mato blocks in the Santos basin. Commercial discoveries were also announced in the Potiguar and Santos basins.

Several International Oil Companies (IOCs) have been cutting investments worldwide, and even revising its corporate strategies away from oil. Shell has cut its dividend for the first time since the 1940s and said it plans to make its traditional business more focused as part of a low-carbon future, announcing plans to become a net-zero emissions energy business by 2050 or sooner (ARGUS, 2020a). Total has also announced a revised corporate strategy, intending to focus more on natural gas and renewables henceforward (PLATTS, 2020a). BP has also declared a major corporate overhaul to transform into an Integrated Energy Company (BP, 2020a).

These global cuts have not affected Brazil's development plans that significantly. Shell has delayed the start in its Gato do Mato FPSO, but it is still advancing with investments (SHELL, 2020). The company initiated drilling a new well in its Saturno block in May, despite the pandemic (IHS, 2020). In June, Petrobras, Shell, Total and Petrogal also started-up a second FPSO in the Atapu field (Iara cluster) (TOTAL, 2020a). Petrobras, Shell, Total, CNPC and CNOOC have also signed a letter of intent to charter a 3rd FPSO for the Mero field in September (PETROBRAS, 2020h). ExxonMobil finished and handed over to Brazil's environmental institute (Ibama) its environmental assessment studies for up to 17 new deepwater wells until 2021 in April (IBAMA, 2020). In July, Equinor also announced it will be maintaining investment plan in Brazil, guaranteeing its main project of Bacalhau (ex-Carcará) is still forecast to start producing in 2024 (EQUINOR, 2020).

⁷ In the first four months of 2020, China was the main destination for sales, absorbing 60% of the oil exported. Besides China, Petrobras usually sells oil to the USA, Europe, India and other Asian markets (ANP, 2020e).

Brazil's upstream growth prospects have been impacted by the global health crisis. Some investments had to be postponed, and some older assets were hibernated ahead of schedule. However, a considerable growth is still being estimated. The government reduced its oil production forecast from 5.5 million b/d to 5.2 million b/d in 2030 (EPE, 2020b). This is still significantly higher than the 2,8 million b/d average in 2019 and the record 3.1 million b/d produced in December 2019⁸ (ANP, 2020a). Natural gas production is also still forecast to increase from 0.7 million to 1.6 million boe/d. The best known assets are still being developed by Petrobras or other IOCs, and exploration is picking up again. Meanwhile, midsize ones are being sold to smaller players, who usually manage to extract more from these type of resources. That is why Brazil's production is expected to continue to grow, especially due to Búzios and Mero fields.

⁸ At the time this report is written, production has almost reached the previous record in July and August 2020.

Mid- and Downstream

The events that transpired over the twelve months under analysis indicate a transition to more competitive and open mid- and downstream segments. Petrobras, Brazil's state-run oil company, remains in control of a leading share of the supply chain for natural gas and oil products. However, important assets in these chains have already, or are being sold. Meanwhile, the government has been re-discussing the regulatory framework in order to guarantee the national supply of fuels.

The Brazilian oil refining segment should enter a transitional period. The new framework is supposed to be one with a greater plurality of agents, more competitive and dynamic. This move is being accompanied by planning and regulatory challenges. The Brazilian refining park has a daily oil processing capacity of 2.3 million barrels per day (b/d), 98% of which is owned by Petrobras (ANP, 2020b). The company included eight refineries in its divestment projects⁹, with a total capacity of 1.1 million b/d, which are expected to be sold by 2021, according to the Term of Commitment for Termination of Practice (TCC - *Termo de Compromisso de Cessação*) signed between the company and the Brazilian antitrust regulator, CADE¹⁰ (EPE, 2020c).

The binding phase of the sale of four of these refineries started towards the end of 2019, and Petrobras has received proposals for Landulpho Alves Refinery (RLAM), its refinery in the state of Bahia (PETROBRAS, 2020i)¹¹. This sale is part of its divestment program, which is in line with its new strategic plan¹². The company wants to focus on its more profitable endeavors, especially its deep and ultradeep E&P assets. Therefore, Petrobras is selling stakes in most of its other activities, such as fuel distribution, biofuel production, fertilizer production, electricity generation, among others (EPE, 2020c).

⁹ The divestments include the sale of the following assets: Abreu e Lima Refinery (RNEST), Shale Industrialization Unit (SIX), Landulpho Alves Refinery (RLAM), Gabriel Passos Refinery (Regap), Presidente Getúlio Vargas Refinery (Repar), Alberto Pasqualini Refinery (Refap), Isaac Sabbá Refinery (Reman) and Lubrificantes e Derivados de Petróleo do Nordeste (LUBNOR), as well as the logistics assets integrated to these refineries.

¹⁰ CNPE Resolution nº 9/2019 established guidelines for the promotion of free competition in the country's refining activity, with the objective of stimulating the entry of new players and attracting investments to the sector, guaranteeing supply, and avoiding the creation of production, transport and distribution monopolies. The antitrust regulator understood that there was a high concentration in the refining segment, and demands that Petrobras completes the sale of all assets by the end of 2021 and sells each asset separately and in order to guarantee market competition after the sale. The regulator has also restricted buyers from acquiring several pairs of refineries because they are located in the same region, which would constrain competition.

¹¹ RNEST, RLAM, Repar and Refap were included in the binding phase that started in the end of 2019 (EPE, 2020c).

¹² Another refinery asset on sale, according to the company strategic plan, is Refinaria Potiguar Clara Camarão (RPCC). It was announced in August, 2020, among upstream assets on Rio Grande do Norte State (PETROBRAS, 2020j).

Petrobras also definitively discontinued the 80% completed refining and petrochemical complex of Comperj in the state of Rio de Janeiro. The company had signed a memorandum of understanding in 2017 with a subsidiary of the Chinese CNPC to try to finalize the project. However, both companies concluded that the project was no longer economically attractive (PETROBRAS, 2019c).

There were also considerable changes in the liquefied petroleum gas (LPG) market. Petrobras sold Liquigás, its distributor of bottled LPG, with a 21,3% market share (ANP, 2020a), to two of its main competitors. This is likely to consolidate the market even further. Furthermore, Petrobras had historically sold bottled LPG in 13 kg canisters at a discount. This had been the policy due to an instruction by the CNPE that prices to residential consumers could be lower than for industrial uses (MME, 2005). This policy affected both demand and investments in the LPG supply chain (MME, 2017). In the second half of 2019, the council revoked this instruction, with effects beginning on March 1st, 2020 (MME, 2019a; 2019b). Even before this date, LPG prices for residential uses started closing in to the levels paid by industrial users (EPE, 2020c). The main objective was to stimulate more investments in a segment with growing demand. Companies were shunning new investments due to the sale of LPG for domestic uses at prices below the purchase price parity (EPE, 2020c).

In the last year, the Brazilian natural gas market underwent several modifications regarding new models for contracting capacity in transmission pipelines, as well as reformulations in state-level regulatory frameworks that affected local distribution companies (LDC). All of these enhancements are in line with the New Gas Market (NGM) program, which is a federal government initiative that aims at creating a more diversified, open and competitive sector in Brazil (MME, 2019c).

Although the natural gas market is open to competition in theory, most of the terminals, pipelines, processing plants and storage up until recently belonged to Petrobras. This concentration, in combination with a loosely regulated third party access, made competing extremely difficult, which explains the quasi-monopoly in producing, importing and transporting natural gas. CADE, Brazil's antitrust regulator, had been investigating the sector for some time. This investigation into the natural gas sector ended with Petrobras and CADE celebrating TCC in July 2019. This commitment ended the investigation into Petrobras' anticompetitive behavior, as long as the company agreed to selling its stakes in companies such as the carriers TAG, NTS and TBG, and its stakes in distribution companies, either selling Gaspetro, or the stakes it holds in other distributors. Petrobras agreed to conclude these sales up until the end of 2021 (CADE, 2019a).

These developments have already had repercussions on the market. Throughout 2019, natural gas supplied domestically remained relatively constant, especially due to the saturation of existing pipelines connecting the main offshore producing regions to the continent, as can be seen in Figure 3. This saturation should be partially alleviated once the gas pipeline Rota 3 connecting the Santos Basin to the continent comes online in 2021 (ANP, 2020f). However, more pipelines are necessary in order to guarantee the flow of a larger part of the natural gas produced offshore to shore (EPE, 2019a). Before Covid-19, domestic demand had been growing, with the industrial and electricity generation continuing to represent the main drivers, with a 55% and a 28% share, respectively (MME, 2020c).

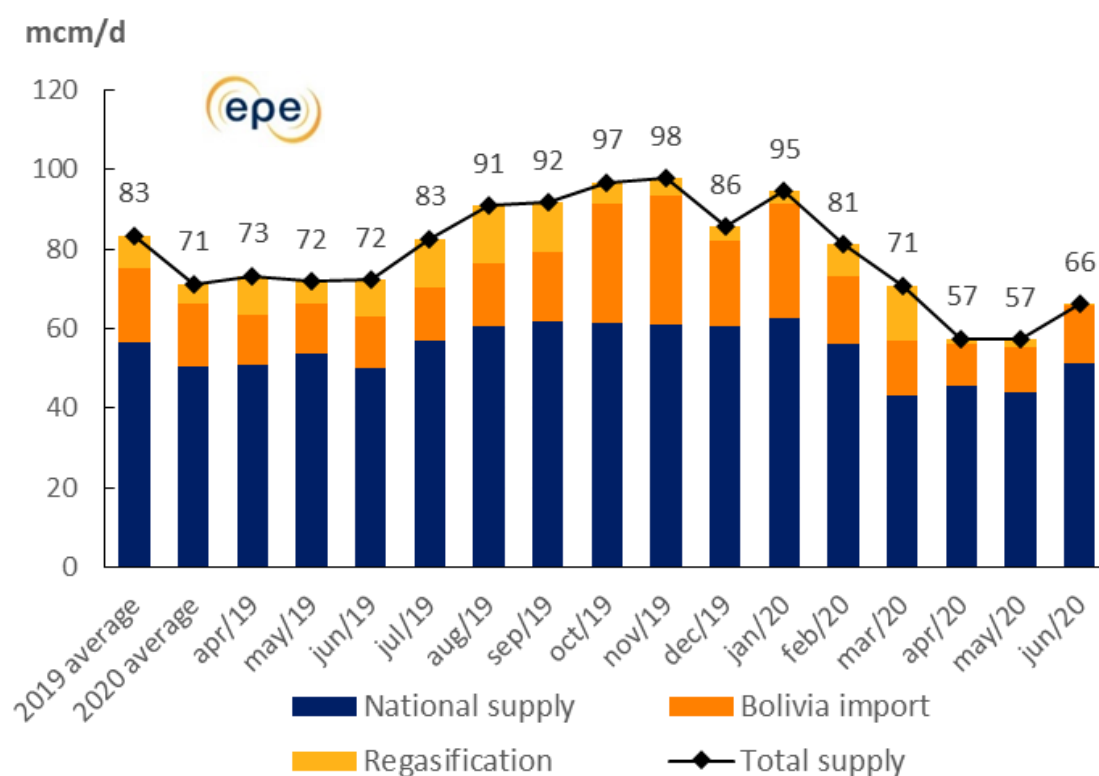


Figure 3 – Natural gas supplied to the market by source

Source: Adapted from MME (2020c)

Historically, supply has been guaranteed mainly through imports via pipeline from Bolivia (Gasbol), and complemented with LNG imports. This has been changing though. Petrobras still is the main cargo importer to Brazil. As LNG prices declined throughout 2019, with FOB prices declining from an average US\$ 8.72/MMBtu in 2018 to US\$ 5.35/MMBtu in 2019, Petrobras has been able to arbitrage its gas imports from Bolivia and LNG terminals, with LNG increasing in significance¹³, as can be seen in Figure 4.

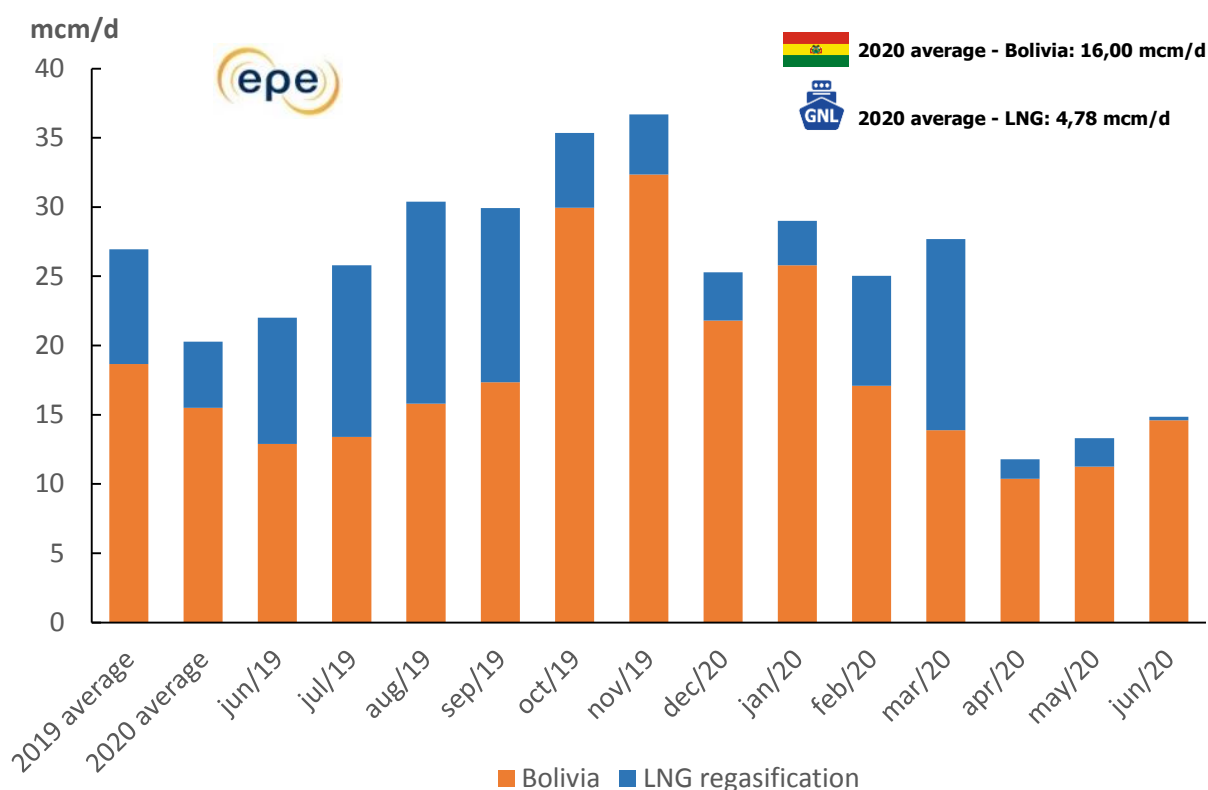


Figure 4 – Evolution of natural gas imports piped from Bolivia and LNG

Source: Adapted from MME (2020c)

¹³ The USA consolidated itself as the largest exporter of LNG cargoes to the country, representing 70% of the volume of gas regasified in the period from January to June 2020 (MME, 2020c).

As mentioned before, the TCC between CADE and Petrobras is partially responsible for the recent changes. Petrobras had to pledge to reduce its stakes in the natural gas market. One of these pledges was to allow others to access imports through the Gasbol from Bolivia. A transitional agreement was signed by Petrobras and Yacimientos Petrolíferos Fiscales Bolivianos (YPFB) under its Gas Supply Agreement from Bolivia in December 2019. In March 2020, a new amendment to the contract was signed, reducing YPBF's gas supply obligation from the pipeline's capacity 30 million to 20 million m³/d. This will allow the remainder of the capacity to be sold directly to other agents, without having to pass through Petrobras. Another development that demonstrates the increasing openness of the natural gas sector is the announcement, in December 2019, that Petrobras will lease its Bahia LNG regasification terminal and connected pipeline (PETROBRAS, 2019d), as well as sell its remaining 10% stake in the carrier TAG (PETROBRAS, 2019e).

Petrobras's diminishing market share and increasing access to the national infrastructure by other players have also stimulated more investments. Petrobras had hibernated parts of its infrastructure in the fertilizer sector, due to its focus on the E&P sector. However, the company managed to lease its nitrogen fertilizer facilities in the states of Bahia (Fafen-BA) and Sergipe (Fafen-SE), as well as its ammonia and urea marine terminals at the Aratu Port, also in the state of Bahia for 10 years, renewable for another 10 years (PETROBRAS, 2019f). This should guarantee the continued operation of these assets, reducing Brazil's fertilizer imports, and stimulating demand for natural gas.

A competitive bid for the construction of a new LNG regasification plant and gas-fired power plant in Barcarena, north of Brazil, won at an electricity auction held in October 2019. Both are scheduled to begin operating in 2025 (EPE, 2020c). The floating storage and regasification unit (FSRU) BW Magna was successfully moored in Porto do Açu, in Rio de Janeiro state. This unit will deliver natural gas to operate the two newly built gas-fired power plant GNA I and GNA II (EPE, 2020c). Brazil's electricity generation capacity is still dominated by hydroelectric plants. However, as electricity consumption continues to grow, and few new projects are being authorized, the country will increasingly depend on new sources of energy. The government is discussing increasing the use of natural gas in the energy mix, especially given the growing associated gas production in offshore fields. This will still require more investments in order to efficiently bring natural gas from platforms located over 300 km away to the coast (EPE, 2019b).

Another way of stimulating the demand of natural gas is small scale LNG use. The company ENEVA launched a project that consists of using trucks with cryogenic tanks to transport LNG from the Azulão gas field in the state of Amazonas to Boa Vista, in the state of Roraima¹⁴. This project will deliver LNG to a gas-fired power plant in Boa Vista (ENEVA, 2019).

The Covid-19 pandemic brought new challenges, with significant effects on consumption, services and industrial activity in Brazil in the first half of 2020¹⁵, directly impacting the oil and natural gas industry. In practice, the effects of the pandemic were seen on the country's economy from the end of the first quarter¹⁶. In April, domestic economic activity reached its lowest level, with partial recovery in May and June.

Industrial activity and mobility reached its trough in April (IBGE, 2020b). The different governmental spheres harmonized some policies, allowing freight to move around freely. Government handouts also permitted consumption to pick up again, which drove a partial economic recovery from May (MECON, 2020a). The oil and gas sector was hit particularly hard. Demand for jet fuel and gasoline fell precipitously, as can be seen in Figure 5. Diesel demand was relatively resilient. This can be explained by the fact that road transportation is responsible for most of the freight in the country. The recovery in consumption, and record agribusiness exports¹⁷, hauled around the country mainly by trucks, impeded further losses of distillate demand. Flights also ground to a halt, with the regulator maintaining daily flights to all the state capitals, which impeded further losses in jet demand (ANAC, 2020).

¹⁴ Roraima is one of the most isolated electrical-grid states in Brazil and used to import electricity from Venezuela (ENEVA, 2019).

¹⁵ Even though the number of cases and deaths was not as high as in Europe in March, fear of contamination and the spread drove most of the main cities and states to a social isolation measures restrict, affecting businesses by the end of March.

¹⁶ The GDP fell 1.5% in the first quarter of 2020 (compared to the fourth quarter of 2019), the biggest contraction since 2015, reflecting the first impacts of the Covid-19 pandemic on the Brazilian economy (IBGE, 2020a).

¹⁷ The Brazilian agricultural exports augmented considerably (MAPA, 2020). One reason for this was the considerable devaluation of the Brazilian currency. For a few months, the aggravation in the sino-american trade relations, in combination with a recovery in China's economy, contributed to record purchases of soy beans, cellulose, meat, iron ore, crude oil, low-sulphur fuel oil, among other commodities (MECON 2020).

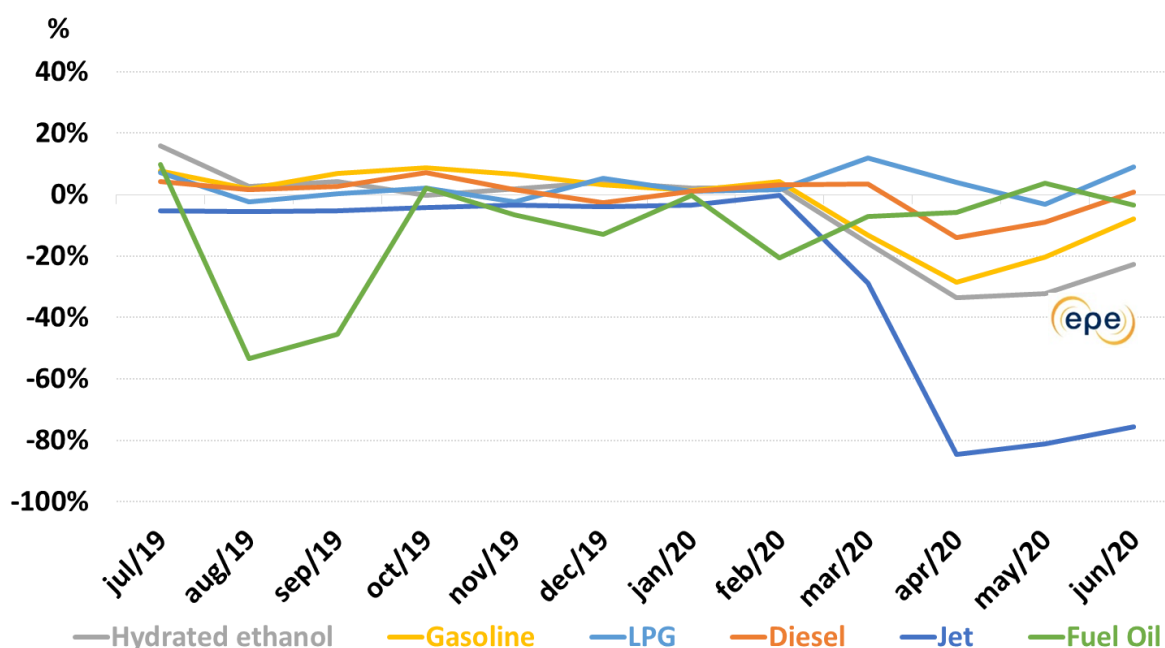


Figure 5 – Change in domestic sales oil product relative to the same month in the previous year

Source: Adapted from ANP (2020e)

The demand for diesel and gasoline recovered in May and June compared to the previous two months, which were impacted by social distancing measures. The demand for LPG has increased, since it is mainly used for residential cooking. Due to the fact that people stay at home longer, the use of LPG for cooking food has been expanded. In addition, precautionary actions led part of the population to anticipate their purchases and to stock LPG cylinders, which explains the increase demand in both March and April.

Hydrated ethanol, which in Brazil directly competes with gasoline since most of the automobile fleet is flex-fuel, suffered an even worse blow. Some sugarcane mills have flexibility in their output, choosing to produce more ethanol or sugar. Many producers decided to make sugar instead, which can be exported, and was interestingly priced due to the currency depreciation. Other ethanol producers that don't have that flexibility had to curtail their production. This caused a significant fall in ethanol supply, keeping its prices more stable than gasoline. This situation seems to have, along with the fall in gasoline prices, permitted gasoline demand to avoid further losses.

As mentioned, diesel oil consumption was more resilient among liquid fuels, due to the movement of goods and the activity of the agricultural sector in the first half of 2020. Jet fuel demand was, and still is, the most affected by the pandemic, due to the restrictions on the movement of people and the consequent reduction in the number of national and international flights. In relation to LPG¹⁸, there was an increase in domestic consumption in the first month of adoption of social distancing and isolation (14%, in April), but with a reduction in consumption in the following month.

Brazil does not have significant oil product storage. Therefore, production was significantly impacted by the reduction in demand, mainly in April, when the utilization factor of refineries reached 59% (MME, 2020d), as can be seen in Figure 6. These rates increased after the refineries managed to alter their production yields, focusing its production on diesel, which was still being demanded, and low Sulphur fuel oil, increasingly exported to Asia¹⁹. Petrobras reached a record high fuel oil exports of 238 thousand b/d during the pandemic²⁰. The oil demand recovery during May and June, especially of gasoline and diesel, raised the utilization rates to 77% in June (EPE, 2020c; MME, 2020d).

¹⁸ In June, the Revap refinery broke the monthly LPG trading record: 75,730 tons of LPG were sold (the equivalent of 5.82 million P13 gas cylinders), versus 71,115 tons from the previous record, reached in May, representing an increase of 6,5%. Revap acts as an important point of supply of LPG for residential use in Brazil, providing the regions of Vale do Paraíba, north coast of São Paulo and south of Minas Gerais, besides other markets by transference made by the distributors via road transportation to supply secondary bases (PETROBRAS, 2020k).

¹⁹ In the refining segment, Petrobras increased his production of bunker and low-sulfur fuel oil streams due to the appreciation of these streams in the international market (owing to the new specification of IMO 2020). The production of these streams is on an increasing trend. The Paulínia Refinery (Replan) broke the monthly production record for Bunker 2020 in June: the refinery reached 148 thousand m³, 20% higher than the previous record registered in May, of 123 thousand m³. (PETROBRAS, 2020l)

²⁰ Petrobras' strategy of maximizing exports of crude oil and low sulfur fuel oil was intended to offset the effect of the strong contraction in Brazilian fuel demand, especially in April, and to preserve the company's liquidity (EPE, 2020c).

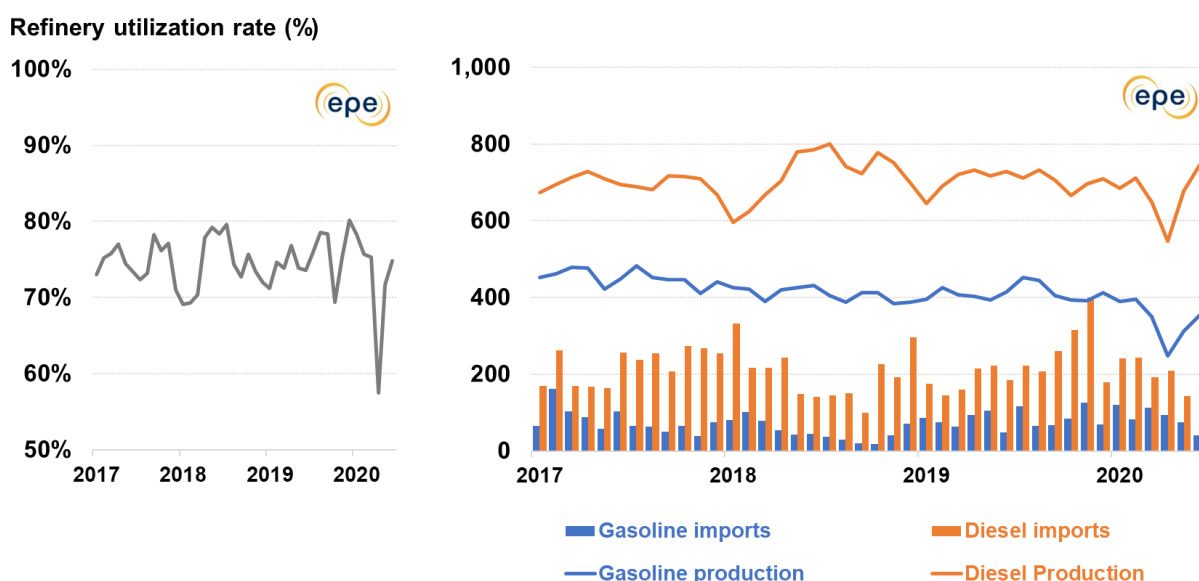


Figure 6 - Refinery utilization rate, and production and imports of gasoline and diesel in Brazil

Source: Adapted from ANP (2020e)

Notwithstanding, the exchange rate devaluation in the first months of 2020 and the fall in the international price of oil contributed to the reduction of fuel prices in refineries and a decrease in the price to the final consumer. However, the scenario changed in June, following a recovery in oil prices, with consequent repercussions on ex-refinery prices of oil products and fuel prices to consumers. Despite the increase in national average prices to the final consumer in June, gasoline C, diesel B and hydrated ethanol accumulated, respectively, losses of 14%, 19% and 18% of their value in 2019. Smaller reductions were registered for the prices of Compressed Natural Gas - CNG (2.5%) and LPG (8.5%) (ANP, 2020e; MME, 2020c).

Petrobras is planning investments to increase the production of low-sulfur S-10 diesel²¹, to the detriment of S-500 diesel. To achieve this, the Reduc and the Revap units will be modernized. A new diesel hydrotreating unit will also be built at Replan²². Another initiative under analysis is the integration of the Reduc unit with Gaslub Itaboraí, which may allow high quality lubricants to be produced with more advanced technology (PETROBRAS, 2020m).

²¹ In July, Petrobras broke the production record of S-10 Diesel, low-Sulphur diesel with less than 10 parts per million of Sulphur: the company's refineries processed 1.6 million m³ of the product. The S-10 Diesel records follow the evolution of heavy-duty and utility vehicle engines powered by diesel, which are responsible for most of the goods circulating in Brazil.

²² In June, Replan reached a production record of 31 thousand b/d of low Sulphur fuel oil, 24% higher than the previous record of 25 thousand b/d. June was also marked by the resumption of operations of a distillation unit (U-200A) and a catalytic cracking unit (U-220), to meet the increased market demand for oil by-products. With the return of these units, Replan resumed its capacity to process 434 thousand b/d, the largest in Brazil's refining system. In addition, there was a record of S10 diesel production, in June 2020 (PETROBRAS, 2020l).

Biodiesel faced some adversities too. Soybean producers took advantage of the high international prices of the commodities, which in combination with a currency depreciation made exports more interesting than local sales. Biodiesel plants could not produce enough biodiesel, which led the government to temporarily reduce the mandatory mixing of biodiesel into diesel from 12% to 10%²³.

The natural gas distribution market was also affected by the effects of Covid-19. Consumption in the industrial sector dropped up to 40% compared to the same month in 2019. In order to avoid generalized breaches of contracts, measures were proposed to local distributors in order to mitigate the fallout. Installment payments were introduced, and supply contracts were eased during the height of the pandemic. (PETROBRAS, 2020n; AGENERSA, 2020). Imports from Gasbol and from LNG terminals were significantly reduced, from an average of 27 million m³/d in 2019 to less than 10 million m³/d in April (MME, 2020c).

FOB prices for imported LNG cargoes cost an average of US\$ 3.62 in the first half of 2020, a 32% reduction from the average 2019 prices. In spite of the currency devaluation, prices paid by distributors were lowered by 15% in the same period. Prices for end consumers were lowered too, ranging from 7% in the state of Ceará to 13% in the state of Santa Catarina (EPE, 2020c).

Petrobras temporarily delayed its divestment program due to the outbreak of the pandemic, but the sale of assets picked up again a few months after the start of the social distancing measures. Demand has been severely hit, but a gradual reopening process is allowing a recovery in demand. However, and especially because jet demand is forecast to recover more slowly, national fuel demand is not expected to return to pre-pandemic levels before the second half of 2021 (EPE, 2020d).

The outlook for the pace of recovery of the Brazilian economy and its fuel consumption is still uncertain. It should also be noted that changes in habits and new patterns of behavior in society may lead to destruction of a significant portion of fuel demand. This environment makes alternatives especially daunting, due to the established infrastructure and distribution assets, that are operating with considerable spare capacity.

The Brazilian government has sent a tax reform proposal to Congress. The matter is relevant, since the current tax system is complex, and taxes represent an important part of the final price of fuels to the consumer. The proposal is to simplify the country's tax structure, establishing a single corporate tax based on the companies' gross revenue.

²³ ANP announced this reduction at the end of June. The decision is valid for biodiesel sales in September and October. (ANP, 2020g)

Furthermore, given the proposal to sell eight Petrobras refineries, and the expectations associated with promoting competition, legal and regulatory security, and predictability of the national supply of oil products, the *Abastece Brasil* Program²⁴, has been carrying out studies on essential facilities and access to oil products transportation logistics infrastructure in Brazil (including pipelines)²⁵. Additionally, the initiative has sought to improve the current biodiesel commercialization and supply chain in the country, in a more competitive market.

Brazil is also a significant agricultural producer. This favors the production of biofuels. Additionally, the Government is further stimulating the demand of biofuels. Renovabio, the national biofuel policy, has recently been approved. It is a state policy that grants credits to clean fuel producers, that have to be purchased by distributors. The more carbon-intensive fuels a distributor sells, the more credit it has to buy. This is on top of mandatory additions of ethanol into gasoline, and of biodiesel into diesel. The increased supply of biofuels may be able to take market share from fossil fuels over the next years (MME, 2020e).

The reduction in gasoline prices threw the balance between the prices off, which is why Brazil's decarbonization credits (CBios) were temporarily reduced due to the pandemic (EPE, 2020c; MME, 2020c). It's important to note that Brazil has the cleanest primary energy supply mix between the biggest economies of the world, and is one of the largest biofuel producers and consumers (BP, 2020b). Notwithstanding, Renovabio intends to further decarbonize the Brazilian fossil fuel market by up to 90 million CBIOs by 2030 (CNPE, 2020).

²⁴ *Abastece Brasil*, program coordinated by the Ministry of Mines and Energy, is one of the instruments of the CNPE in the formulation of guidelines for the fuel sector. One of its main objectives is to guarantee the supply of oil products throughout the national territory and to benefit the consumer, with better conditions of price and quality of products.

²⁵ In addition, the ANP has been working on the revision of the regulatory framework for the sale of oil products and the revision of the rules for use, from third parties, from waterway terminals. The agency is also revising biodiesel/green diesel resolution, which defines the specification of this renewable fuel. This could increase and/or improve the renewable use in Brazil, attracting investments focused on cleaner technologies or sources. Petrobras, for example, has recently concluded tests for the industrial production of hydrotreated vegetable oil (HVO) in Repar (PETROBRAS, 20200).

The crisis was an opportunity for changes being discussed in the context of the New Gas Market (NGM) Program to be implemented. The objective of the NGM is to design new regulatory framework, negotiated between the Federal Governments, State governments and market participants (MME, 2019c). Of note is the announcement of a public call for capacity reserve in the Bolivia-Brazil gas pipeline (Gasbol), which will permit other agents to access imports from that source (TBG, 2019). Petrobras, constrained by the TCC it signed with Brazil's antitrust regulator, started offering third-party access to its natural gas processing plants. Local producers would be able to contract the services of these plants without having to first sell their production to the state-owned company. The Bill nº 6,407/2013, which implements much of the above into law, was supported by the Ministry of Mines and Energy in October 2019 (MME, 2019c)²⁶. The innovations introduced by this bill are intended to harmonize state legislations across the nation and to remove barriers for market development. This, in turn, should help attract more producers and stimulate more demand, as well as increase market competition that could result in a domestic gas price reduction.

²⁶ It was also approved by the lower house of Congress in August 2020 (BRASIL, 2020), still needing to be ratified by the Senate to become law.

Final Remarks

Since the discovery of prolific pre-salt deposits offshore Brazil's southeastern region in 2006, the country has been hailed as the next big oil and gas producer. Over the past few years, changes in the market, in company strategies and in regulation have started to allow these expectations to materialize. Even the Covid-19 pandemic, that has disproportionately hit the global upstream oil and gas industry, has not materially dimmed projects, investments decisions and forecasts for this industry in Brazil.

Domestic oil and gas production reached a record high of 4.0 million boe/d in January 2020. The start-up of new FPSOs was the main factor responsible for this growth in pre-salt output. And this is only the beginning, with Petrobras announcing 13 more FPSOs by 2024. The global health crisis did significantly affect the sector, with oil and gas production bottoming out at 3.5 million boe/d in May. However, as the fear that global inventories would reach their tank tops subsided, and as China's economy recovered, production rose again. The pandemic did force the postponement of licensing rounds and the arrival of new FPSOs. However, investment decisions were largely maintained.

A series of successful licensing rounds, in addition to declining costs due to the accumulated experience drilling and producing in the pre-salt, have all but guaranteed the future development of the discovered resources. This should also stimulate further exploration. Even IOCs, that have been cutting investments worldwide, and revising corporate strategies away from oil, have reaffirmed their commitments to Brazil. Additionally, the sale of midsize assets to smaller players should guarantee more resources to be extracted from these mature areas, reducing decline rates. As a consequence of the pandemic, the government did reduce its long-term oil forecast. Nonetheless, a considerable growth is still being forecast, with the country's production expected to reach 5.2 million b/d of oil and 1.6 million boe/d of natural gas in 2030.

The natural gas market is another highlight. This market is currently undergoing an opening process that started with discussions including stakeholders from the entire gas market supply chain and the assessment of international experiences. This process was reinforced through the establishment of the New Gas Market Federal program and monitoring Committee, and continues with the approval process of Bill 6,407/2013.

This opening process aims at improving the production, importing, transmission and commercialization regulatory frameworks for natural gas, in order to enhance the competitiveness, liquidity and diversity of the Brazilian natural gas sector. Recent development reaffirm that this process is well under way. Petrobras has reduced imports from Bolivia, allowing other participants to start importing through Gasbol. Local Distribution Companies were also able to reduce prices for final consumers, especially because of new contracts based on oil prices.

The fuel sector is undergoing major changes with the commitment to sell half of state-run Petrobras' refining capacity until the end of 2021. The company currently holds 98% of the refining capacity. Brazil is dependent upon fuel imports. Expectations point that the entrance of private players should improve competition and increase investments. New maritime terminals, cabotage initiatives, pipelines and railways are needed to improve transport and distribution capability, so refinery operators can better compete for market share.

The pandemic hit fuel demand especially hard. Industrial activity and mobility reached a trough in April, with the demand for jet fuel falling over 80%, and for ethanol and gasoline almost 40%. Demand for diesel remained relatively stable. This precipitous decline in demand and the change in the energy mix, added to the limited oil product storage in Brazil, forced refineries to reduce their utilization significantly. Even though demand is yet to fully recover, refineries have been ramping up production, especially due to record exports of low-Sulphur fuel oil.

Expectations indicate a recovery in global economic activity in the coming years, as business operations normalize and travel restrictions ease. But, some new developments in the behavioral patterns, caused by the outbreak of the new coronavirus' health crisis, such as remote working, may lead to a slower growth in energy consumption, especially fossil fuels for transportation. Even taking this into consideration, Brazil's oil and gas industry growth prospects are very positive. Oil supply should continue to increase, driven by future and already committed investments, especially due to the prolific reserves and declining exploration costs. Oil product and natural gas demand should also continue growing, as per-capita income increases and more people become part of the middle class. This growth will guarantee demand for new downstream assets, which, in combination with a more competitive and investor-friendly market and regulation, should attract more investments and players.

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