

# Firjan

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## RIO: A MARITIME STATE

The Oil & Gas market has a vastly known potential. However, there is an even higher real expectation of profitability for the segment if we consider ocean floor ore exploration and offshore wind generation. Also, the so-called pre-salt mirror, with new maritime boundaries and the expansion of the Blue Amazon, are real. There is no doubt about Brazil's wealth, largely concentrated in Rio de Janeiro waters.

In addition, it is important to highlight that Rio de Janeiro has the most diverse energy matrix, from nuclear power plants, small hydroelectric plants, gas-based thermal plants, biofuel producers, fossil fuels and others. A leader in national maritime development, our state is a recognized landmark of the naval industry, the country's premier cruise tourism destination, headquarters of the Brazilian Navy Command, base of internationally renowned research centers, and the largest offshore oil and natural gas producer in both post-salt and pre-salt layers.

In view of the 4.0 industry, Rio has been, for over two decades, already interconnected to the underwater fiber optic network that connects the world, a fundamental movement for digitization.

All opportunities at sea unfold in the state economy, either through support bases to the operation, established companies that supply goods or services to the maritime environment and consumers of oil or natural gas produced.

Firjan's goal, especially SESI's and SENAI's, is to contribute to the state with the best response to industry challenges. Thus, observing the projections to serve only the oil market, the need for workforce qualification is increasingly growing and already looking at the emergence of new professions, which is a product of the transformation that the world experiences.

This billion dollar market, hundreds of thousands of jobs and countless opportunities can not be considered as something apart, but the largest portion of Rio, as the capital of energy.

As an institution, Firjan will continue to strengthen the state's productive and intellectual competencies, also strengthening strategic partnerships and delivering solutions for the benefit of companies and society.

For the state to continue as a protagonist, it is necessary to make the right choices and to turn all forms of energy profitable.

**Eduardo Eugenio Gouvêa Vieira**  
President of Firjan

DATA

## OIL, GAS AND MARITIME IN RIO

**13<sup>th</sup>**  
BIGGEST OIL PRODUCER IN THE WORLD, CONSIDERING RIO DE JANEIRO STATE AS A COUNTRY



**82%**  
FROM THE CONFIRMED INVESTMENTS IN RIO ARE OIL AND GAS PROJECTS



**55%**  
OF BRAZIL'S GROSS PRODUCTION OF NATURAL GAS AT THE 1<sup>ST</sup> SEMESTER OF 2019



**1<sup>st</sup>**  
STATE PRODUCER OF LUBRICANTS IN THE COUNTRY



**68%**  
OF BRAZIL'S CNG CONVERSIONS IN THE 1<sup>ST</sup> SEMESTER OF 2019



THE BRAZILIAN STATE WITH THE **MOST** DIVERSE ENERGY MATRIX



Sources: ANP, BP Statistical Review, Otimiza and Firjan (2019)



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INTERVIEW

## “PRE-SALT MIRROR”: A REALITY FOR 2020

The Brazilian federal government is already addressing legal issues, aiming to include the first pre-salt mirror blocks in the 17th Bidding Round next year. This is the expectation of the Minister of Mines and Energy, Bento Albuquerque, in an exclusive interview to Firjan Petroleum magazine. The minister also points out that the type of contract to be adopted will be one of concession – not production sharing – but officially states as premature to scale the size of the wealth to be delivered with this new frontier. He recognizes, however, that the area consolidates the country as an investment hub for the world oil industry. In the market, it is estimated that the new front will increase the volume of oil and gas reserves in the country by 50%, that is, from 15.9 billion barrels to about 24 billion.

### What is the government's expectation of the “pre-salt mirror”?

According to preliminary seismic-based studies, we expect significant exploratory opportunities beyond the current pre-salt polygon area. The natural advancement of the exploration and development projects from the current contracted

production areas and the related ones to be offered in the next bidding rounds – namely the “6th Production Sharing Round” and the “16th Concession Round” – should pave the way to increase the companies' interest in blocks offered in the extension of the continental shelf in southeastern Brazil.

## “ OUR EXPECTATION IS TO ENABLE BLOCK OFFERINGS THROUGH THE EXTENSION OF THE BRAZILIAN CONTINENTAL PLATFORM ALREADY IN THE NEXT YEAR, IN THE 17TH BIDDING ROUND ”

MINISTER BENTO ALBUQUERQUE

### It is possible to estimate the size of this new wealth?

The prospects already identified are numerous. The advancement of exploratory activities beyond the pre-salt polygon, especially considering oil and gas discoveries, should foster the companies' interest in blocks that will be offered. At the moment I consider it premature to risk numbers, considering that there are no drilling activities in this region or discoveries that can be considered for analogies.

### Which impact can it have on the country's development?

Extending the pre-salt oil province to the east beyond 200 nautical miles will mean the country's consolidation as an investment hub for the world oil industry. After all, the deposits already discovered are large, oil is generally of excellent quality and productivity is high.

### Which is the Ministry's short and long term planning for this new frontier? What could already be advanced on the topic?

At the moment we are dealing with legal issues for the proper formatting of the bidding documents, namely the public notice and contract model, considering the location of the blocks beyond 200 nautical miles, in the extension of the Brazilian continental shelf.

### When do the bidding rounds usually start? Speaking of 2020, do you work aiming that date?

We expect to make the offer of blocks in the extension of the Brazilian continental shelf viable next year, during the 17th Bidding Round.

### And what is the regime advocated by the Ministry, concession or sharing?

Under current legislation, the sharing regime is applied in bids within the pre-salt polygon, defined in Law No. 12.351/2010, and in areas that are declared strategic, depending on the finding of low exploratory risk and high potential. Thus, as occurred with the ultra-deep water blocks of the Campos and Santos Basins offered in the 15th and 16th Round, the type of contract to be adopted should be that of concessions.

### Should the private initiative take the risk on exploring the area?

Yes. Our understanding is that investments should be attracted and that any risks may be assumed by the private entrepreneur. There is no legal provision for the Union to assume risks in such ventures.

### Which actions do you see as necessary to ensure the safety of these assets?

The security of these assets goes through the guarantee of national security, which has been obtained by the performance of our Navy, mainly.

## “ AT THE MOMENT WE ARE DEALING WITH ISSUES OF A LEGAL NATURE FOR THE PROPER FORMATTING OF THE BIDDING DOCUMENTS, WHICH ARE THE CONTRACT MODEL AND PUBLIC NOTICE, CONSIDERING THE LOCATION OF THE BLOCKS BEYOND THE 200 NAUTICAL MILES ”

MINISTER BENTO ALBUQUERQUE



MARKET

# MARKET EXPANSION ONSHORE AS A REALITY

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The goal of doubling onshore production in Brazil by 2030 should be reached even before the date stipulated by the Revitalization of Exploration and Production Activity in Terrestrial Areas program (Reate 2020), re-launched in August by the Ministry of Mines and Energy (MME). This is what Anabal Santos Junior, executive secretary of the Brazilian Association of Independent Oil and Natural Gas Producers (ABPIP), anticipates. The National Agency for Petroleum, Natural Gas and Biofuels (ANP) estimates that this market involves 14 states of the country, with potential to generate 700,000 jobs, but the transformative environment is not restricted to producing regions. The state of Rio also has a lot to gain.

“The onshore increases the chances of business for small and medium-sized Brazilian companies,” says Raul Sanson, vice president of Firjan. After all, on land everything is simpler to work than at sea, whether for those who drill, operate, provide services or sell equipment. “Even for those who want to be an oil operator, the values are much lower. That’s why Firjan is involved in defending this market. We glimpse that we can have industries

in the state of Rio de Janeiro, as we have had in the past even producing rigs, among other equipment,” he adds.

The potential for opening opportunities is encouraging. As a producer of 70% of the country’s offshore oil and natural gas, Rio has specialized goods and services companies, as well as a broad knowledge base, features that can be harnessed on this new frontier.

Karine Fragoso, Firjan’s Oil, Gas and Maritime Manager and General-Director of Brazil’s National Petroleum Industry Organization (ONIP), says that Rio de Janeiro companies can participate in this movement. “Before we go to the international market, there is the national market, with many possibilities for companies in Rio.” According to her, there are two ways for participation: through the ANP Permanent Offer Cycles, which has the exploratory risk, natural from the activity; and the development of production, with an increase in the oil recovery factor. In the latter case, the company comes with technology, generating greater efficiency in that area in which it was already producing.

It is the so-called divestment process of Petrobras. “It makes sense that these areas are aimed to smaller companies. The Petrobras’s divestment from production areas, where it is already known to have oil, brings less risk to the operator,” she emphasizes.

There are issues to be resolved, but the path is already outlined. Multiple agents acting in exploration and production (E&P) and proper regulation are ABPIP’s two main pleas. Regarding the first point, the result of the 1st Cycle of the Permanent Offer, on 9/10, indicates that the country follows this path in practice. Petrobras did not participate in the bidding process and new domestic and foreign companies entered the Brazilian market.

“Success is as we can have more contracted areas of exploration and, for that matter, we had 33, that is, one day we contracted 10% of what we already have, and in the last offer (in the 14th Round), no block was awarded,” says José Freitas, ANP Terrestrials Area Coordinator. Although Freitas indicates that regulatory changes led to the outcome of the bidding process, the road still faces obstacles regarding these issues.

## Main goods



- Drill bits
- Wellhead
- Production string
- Well Equipment
- Drilling and injection fluids
- Casing
- Christmas tree
- Field instrumentation
- Automation system
- Electrical system
- Transfer pumps
- Flow lines
- Production / Injection lines
- Manifolds
- Tanks
- Compressors
- Filters
- Engines
- Cathodic protection
- Burners
- Steam generation system
- Process system
- Cooling system
- Fiscal measurement system
- Telecommunication system
- Heat exchangers
- Valves
- Pressure vessel

## Main services



- Rig chartering
- Data acquisition
- Onshore support base
- Cementation
- Construction
- Basic engineering
- Detailing Engineering
- Project management
- Installation
- Integration
- Interpretation and processing
- Logistics
- Mounting
- Earthmoving

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Reate 2020 itself formed four groups, with the participation of the private sector, to build an Integrated Action Plan in order to foster the supply chain: regulation and innovation; institutionalization of industry and multiplication of both oil and gas and goods and services companies; onshore gas; and promotion of free competition.

**PRACTICALLY AT GROUND ZERO**

Acting on behalf of the independent producers, Santos is confident, but points out that the country is still practically at ground zero. "Our parameters are all offshore. The obligations of a well that produces five barrels per day are the same as those of a field like Lula's, which produces 30,000. Regulation is unnecessarily complex for low impact assets," he emphasizes, who advocates the creation of an onshore oversight at the ANP. The Land Area Coordination, he explains, performs a fundamental job, but does not have the necessary autonomy.

8 "It is not possible for Brazil, with these continental dimensions, to have almost insignificant onshore participation. If we compare with other countries here in South or North America, we lose a great bit. We have one of the largest sedimentary basins in the world and one of the lowest exploration rates. We only know 5% of our basins and, in which we did some exploration, we have one of the smallest recovery factors in the world, around 20%," he says.

Among the obstacles, he mentions the ANP's lack of time to streamline procedures and to resolve disputes, as happened with the Administrative Council for Economic Defense (CADE), which, in September, had 30 days to complete the analysis of summary mergers, that is, those of less complexity – as are the cases of onshore E&P.

Another plea involves the simplification of reports, which must be completed and delivered in person to the regulatory agency. "In Canada, at the Alberta Regulatory Chamber, where there are 900 regulated, only by cutting down information that was requested twice or unnecessarily arrived at the

agency, the system was able to save US\$ 1.9 billion a year. For companies operating in the terrestrial fields, this is very impactful," warns Santos, for whom small changes can have major effects on the onshore market.

The adoption of terms of conduct adjustment (TAC) in case of nonconformities is another demand. "This mechanism will help the overall process because the fines are expensive. Either the company pays with 20% off or resorts to a lawyer, which sometimes costs as much as," he notes. The ANP – says Freitas – is working to adjust the issue. "In general we are working to adopt TACs in all areas, but there is the other side: if the company thinks the fine is high-priced, do not cause such an application," he says.

Regarding the field section process, Freitas says that the new regulation specific to the theme is expected up to mid-2020. The regulation of the onshore as a whole will require a continuous process of adaptation to the shallow waters characteristics, involving all areas of the ANP. With this, "from 2020 onwards we will see a very vigorous onshore activity in Brazil," he predicts.

**ONSHORE PRODUCTION IN BRAZIL**

**2030 target**

**500 THOUSAND BARRELS PER DAY**

**+ 50 MILLION CUBIC METERS OF NATURAL GAS/DAY**

**R\$ 4 BILLION PER YEAR IN INVESTMENTS**

Source: Reate 2020



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**SUCCESS CASE**

**DIGITAL TRANSFORMATION FOR O&G**

A project that encompasses augmented and virtual realities, artificial intelligence, big data and machine learning to create the first platform of the so-called "Gêmeo Digital" (Digital Twin) – a virtualized copy of real processes – of a FPSO in Brazil. This is the premise of PredictMain 4.0, a digital transformation process that uses algorithms for predictive maintenance and has the potential to achieve operational efficiency, improving performance, reducing maintenance costs and preventing failures and accidents

The initiative is the result of a partnership between Repsol Sinopec Brasil and the SENAI Institute for Innovation in Virtual Production Systems (ISI SPV), as well as Aveva, Schneider Electric Software Brazil, Cimatic / BA and Petrobras. The project inserts in a 3D digital environment the FPSO P-50, which has been operating for over 10 years in the Albacora Leste field in the Campos basin, and also the platform in the Yme field in Norway, which has been operating since the beginning of the year.

"The SENAI Innovation Institute's experience with risk simulation tools, development of algorithms and expertise in creating tools in augmented and virtual realities were critical to this digital transformation," says Leonildes Soares, Repsol's technical advisor.

Launched in October this year, PredictMain 4.0 provides a full-time monitoring of equipment operating conditions. Thus, the algorithms identify any change in the pattern, generating a warning in the system. The project also presents augmented and virtual reality applications, both for training new employees and for use on refinery platforms and yards, ensuring safer and more accurate activities.

"Digitalization initiatives are focused on getting operations to evolve in order to reduce emissions, risk, unplanned downtime and operating expense costs, besides increasing productivity. Innovations like this are shaping industries, including the Oil & Gas market," explains Eric Cardona, ISI's Research, Development and Innovation coordinator.



COVER

# RIO, CAPITAL OF ENERGY

Largest producer of oil and natural gas, largest generator of thermal gas and the only federative entity with nuclear power generation in the country. This is the relevance of the state of Rio in the energy context. No wonder the state government is working to relaunch the Rio Capital of Energy program, which had already been conceived in 2012. The program will have goals, indicators and deadlines to build a state energy plan, aligned with the federal government, which will guide Rio de Janeiro's energy policy for the next decade.

"The energy produced in our territory is an important input for the development and economic competitiveness of the country. In addition, we are home to the main national and international companies of this production chain. This makes us important for Brazilian energy security," explains Lucas Tristão, Secretary of State for Economic Development, Employment and International Relations.

In this way, Wilson Witzel's government restructured and updated program governance, setting new guidelines in agreement with the proposals of the Ministry of Mines and Energy. The initiative also incorporates recent challenges, such as the Free Gas Market, the modernization of the electric sector, the energy transition, the decentralization of the activities of the National Electric Energy Agency (Aneel) in the state, investments in research, development and

innovation (RD&I), the cost of energy, among other subjects. According to Tristão, the program features three pillars: reliability, competitiveness and transition.

## NOW IS THE TIME OF NATURAL GAS

For Federal Representative Christino Áureo (PP-RJ), coordinator of the Parliamentary Front for the Sustainable Development of Petroleum and Renewable Energy, the resumption of the Rio Capital of Energy program is timely. "The program is reinforced as we debate in the House of Representatives the new regulatory framework for natural gas, known as the New Gas Law, and that will certainly be a movement in favor of the state of Rio," he explains.

According to him, in Rio, the gas symbolizes the possibility of boosting the industrial sector already installed in the state, in addition to attracting new companies that are paying attention to the cheapening of energy. "As the Gas Law, which gains legal certainty, is modernized, we tend to reduce the price of the product. Our challenge is to find a middle ground in order to ensure greater access to cheap energy, not only by enabling industrial development and strengthening of our thermoelectric park, especially in Macaé and the North Fluminense region, but also to secure more space for this energy base as safe for the transition of the so-called alternative energies," ponders Áureo.

In addition, the Parliamentary Front advocates expanding the residential service network as well as NGV (natural gas vehicle) to serve taxi drivers, app drivers and to increase the gas-powered bus fleet and truck transportation. "We are working so that these segments benefit from the New Gas Law," informs.

## GAS AND ELECTRIC MARKET INTEGRATION

One of the companies excited about the news is the Natural Gas Açú (GNA). The company is dedicated to the development, implementation and operation of structuring and sustainable energy projects. In Rio, it is building the largest gas-fired thermoelectric park in Latin America, at Açú Port, in São João da Barra, in North Fluminense.

The goal is to make it an anchor for the development of a hub in this sector, which will contribute to the integration of the transportation network and the pre-salt gas monetization. "The integration of the gas market with the electricity sector is extremely important for the new gas market to work," reinforces Bernardo Perseke, the company's CEO.

With an investment of R\$ 8 billion, this first phase of the project comprises the Thermoelectric Plant 1.3 GW GNA I and 1.7 GW GNA II plus a LNG Regasification Terminal (Liquefied natural gas). According to Perseke, GNA I construction works

are at 70% physical progress and are expected to start operating by 2021. In turn, GNA II should start operating in 2023. Together, the two thermal plants will account for 17% of Brazil's natural gas thermal generation, with capacity to meet the consumption of 14 million homes.

## PILLARS OF THE PROGRAM



### Reliability

Statutory guidelines and energy policies also from renewable and alternative sources.



### Competitiveness

Attract investments to minimize energy costs and to increase service quality.



### Transition

Make Rio pioneer in the energy transition of the country - from the attraction of the production chain and the development of renewable sources.

## UPCOMING BIDDING ROUNDS

The ANP is optimistic about the result of the next three bidding rounds scheduled for this year: the 16th Bidding Round, the 6th Production Sharing Round (Pre-salt) and the Assignment Surplus. In addition, it considers the realization of the 1st Cycle of the Open Acreage of Areas a historic moment for the Brazilian Oil and Gas market.

"It marked the beginning of a new era of Brazilian upstream, with companies of all sizes having the possibility to acquire areas after in-depth studies and when they find the right investment. The Open Acreage of Areas is the pillar of the new oil industry in Brazil," says Décio Oddone, ANP's director-general

According to him, these rounds have the potential to attract players of different sizes and profiles, as they offer areas in all Brazilian exploratory environments: onshore, traditional offshore and pre-salt, as well as areas with marginal accumulations.

"Although it is not possible to foresee the collection by state, because it will depend on which areas will be auctioned and which will be declared commercial by the companies in the future, it's clear that the investments should be in the range of billions of Brazilian Reals, not to mention the taxes that will be collected and the government participation, generating jobs, income and technological development for Rio de Janeiro," he adds.



### BIDDING ROUNDS 2019 - 2<sup>nd</sup> SEMESTER 2019

**1<sup>st</sup> Cycle of Permanent Offering (9/10)**  
45 areas were acquired, almost all onshore, totaling a forecast of R\$ 320.3 million in investments.

**16<sup>th</sup> Concession Round (10/10)**  
It will offer 36 areas in five coastal basins Brazilian east, 21 of which in Rio.

**6<sup>th</sup> Production Sharing Round (11/07)**  
The pre-salt exploration will continue, with the offer of two from six areas in Rio.

**Assignment Surplus (11/06)**  
Offering of four areas in Rio: Atapu, Búzios, Itapu and Sépia, in the Santos Basin.

### 2020 and 2021 BIDDING ROUNDS - IN STUDY

**7th Production Sharing Round**  
Areas at Campos and Santos Basins.

**8th Production Sharing Round**  
Areas at Campos and Santos Basins.

**17th Concession Round**  
Areas in Campos and Santos, Pará Maranhão, Pelotas and Potiguar Basins.

**18th Concession Round**  
Areas in the Ceará, Pelotas and Espírito Santo Basins.

Gabriel Kropsch, vice president of the Brazilian Association of Biogas and Biomethane (ABiogás), evaluates the program as promising, since one of its goals is the development of the energy sector in a sustainable way. Studies carried out by ABiogás show that Brazil wastes more than 84.6 billion cubic meters per year of biogas (which comes from the decomposition of organic matter), which would be sufficient to supply 40% of the country's electricity demand or the equivalent of 70% of all diesel consumed in 2018. Rio alone has the potential to produce almost 1 million cubic meters of biogas per day, which requires investments of around R\$ 1.5 billion, with the capacity to generate more than 2,000 highly qualified jobs. Thus, the potential of biofuel must also be exploited.

"Economically competitive biogas is, bringing cost savings over fossil alternatives," he says. Thus, with public policies that regulate and encourage energy efficiency, for him, this potential can be harnessed by offering 100% renewable energy at a competitive cost. "With the start of the National Biofuels Policy (Renovabio) next year and the commercialization of Decarbonization Certificates (CBIOS) there will be an even greater incentive for investment in new production units," says Kropsch.

### EXPLORATION AND PRODUCTION

With a portfolio of 20 assets located in seven offshore Brazilian basins - including the Campos and Santos basins, both located in part off the coast of the state of Rio de Janeiro - Total E&P also welcomes the program. The multinational expects to invest about US\$ 1 billion per year in its oil exploration and production (E&P) activities in the country in the coming years. "In addition to the E&P market, we believe there is room for new business in the country, including natural gas and renewable energy, especially in a global energy transition scenario. The recent regulatory advances proposed in the program are fundamental to the opening and development of the domestic market," says Philippe Blanchard, current president of Total E&P do Brasil.

He notes, on the other hand, that the convergence of federal and state regulations is a point of attention for projects to be competitive: "The state of Rio has a lot to contribute to the national energy market, and a possible resumption of the Rio Capital of Energy program could be positive, representing another way to boost the business environment and to help

diversifying the inflow of new investments, placing Rio beyond the Oil and Gas chain."

Equinor, the largest international operator per volume, due to the Peregrino field in the Campos basin, also expects more investment in the coming years. "We have already invested US\$ 10 billion in Brazil and plan to invest another US\$ 15 billion by 2030 in oil and gas projects," says Verônica Coelho, vice president of Development and Production of the operator in the country. The company will begin phase 2 of Peregrino, where a third platform will be installed, expected to operate by the end of 2020. Peregrino C, in turn, will generate approximately 200 direct long-term offshore jobs, with indirect effects on land.

Eduardo Eugenio Gouvêa Vieira, president of Firjan, evaluates as positive the willingness of the new state management. "In addition to exploration and production, we have other opportunities in the natural gas market, which is produced associated with oil in the state. This market of countless opportunities must be considered Rio de Janeiro's great asset for development," he says. He reinforces that the country has great untapped potential, and the biggest discoveries are in Rio de Janeiro waters.



## DID YOU KNOW?

# #ForTheRisksTheRoyalties



Government take is reward for increased social and environmental demand in the areas where the activity occurs. In these places, there is greater population concentration and risk of damage to the environment.

Between 2010 and 2018, the average population growth in the 25 largest municipalities producing oil and gas in Brazil was 16.7%, against 9.3% in the country.



The Union receives the largest amount of revenue from government take in oil and natural gas exploration.

**54%**  
IN 2018

Should the distribution of royalties occur, producing states and municipalities immediately go into financial crisis without causing it.



Royalties, special participation and signing bonuses are not taxes. These are compensations paid for the right to exploit, for a limited time, the oil and natural resources of a localized area in a particular state and city.



The 1988 Brazilian Federal Constitution already provided that the ICMS taxation on petroleum and fuel derivatives should not be left to the producing regions as a means of distributing wealth throughout the country and offsetting the receipt of government take.



Whom will suffer directly from possible environmental damage resulting from the activity is the producing region, with no impact on a region far from eventual leakage.

Royalties also exist for water used for power generation and mining, for example, and will not be shared with non-producing regions.



### BUSINESS

**Firjan:** President: Eduardo Eugenio Gouvêa Vieira • 1<sup>st</sup> Vice President: Carlos Mariani Bittencourt • 1<sup>st</sup> Firjan CIRJ Vice President: Sérgio de Oliveira Duarte • 2<sup>nd</sup> Firjan Vice President: Carlos Eduardo Gross • 2<sup>nd</sup> Firjan CIRJ Vice President: Raul Eduardo David de Sanson. **General Communication Management:** Paola Scampini • Rita Fernandes • Gisele Domingues • Responsible journalist: Fernanda Portugal. **Oil, Gas and Maritime Management:** Karine Fragoso • Thiago Valejo • Renata van der Haagen • Fernando Montera • Heber Bispo • Iva Xavier • Priscila Felipe • Verônica França. **Edited by Insight Comunicação:** General Editor: Coriolano Gatto • Executive Editor: Sílvia Noronha • Writing: Lais Napoli • Joana Ferreira • Juliane Oliveira • Review: Geraldo Pereira • Photography: Getty Images • Graphic Design: Paulo Felipe de Menezes Quintão (Firjan) • Design and Layout: Paula Barrenne • Graphic Producer: Ruy Saraiva • Printing: Imos Gráfica • Firjan: Avenida Graça Aranha, 1 - CEP 20030-002 - Rio de Janeiro. Tel.: (21) 2563-4455 • oil.gas@firjan.com.br • www.firjan.com.br/petroleoeegas