

ANP - National Agency of Petroleum,
Natural Gas and Biofuels

Oil and Gas Opportunities in Brazil

2017 - 2019 Bidding Rounds

June 2017



NATIONAL AGENCY OF PETROLEUM,
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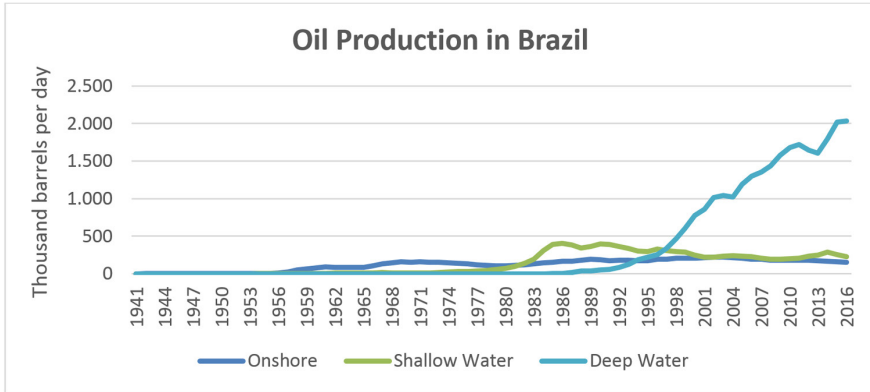
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Summary

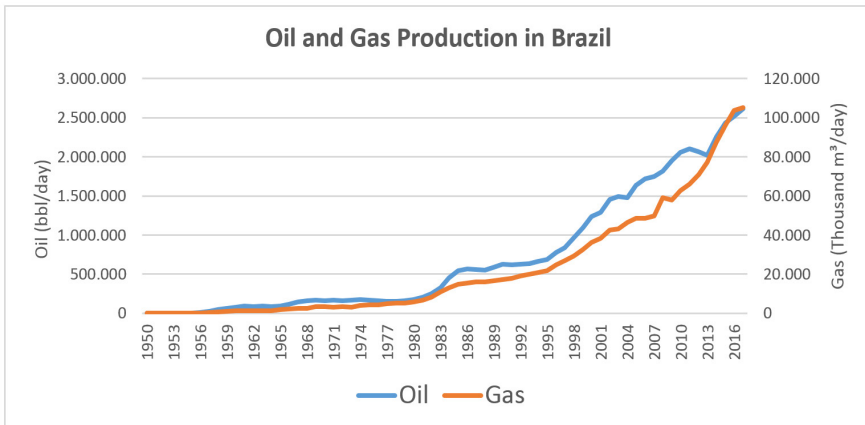
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1. Background

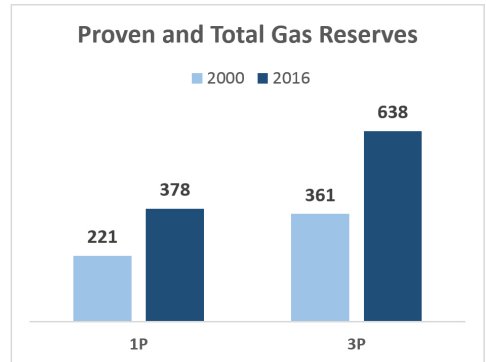
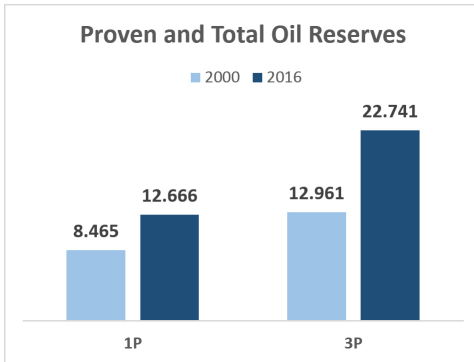
The oil production in Brazil began in 1941, in an onshore field called Candeias, in Bahia. Since then, exploration has advanced to shallow and deep waters, which now account for most of the produced volume.



Until 1997, Petrobras, the state-owned company, had a monopoly on exploration and production activities and produced less than 900,000 barrels of oil per day. Fourteen bidding rounds later, current oil production exceeds 2.5 million barrels per day in almost 300 fields in production.



Oil proven reserves increased from 8.5 billion barrels in 2000 to 12.7 billion barrels in 2016. Meanwhile, gas reserves grew from 221 to 378 billion cubic meters.



By the end of May 2017, more than 700 areas were under E&P contracts of which around 300 were in the exploration phase and more than 400 in the production and development phase. Today, 95 economic groups operate in the oil and gas sector, of which 48 are foreign companies.

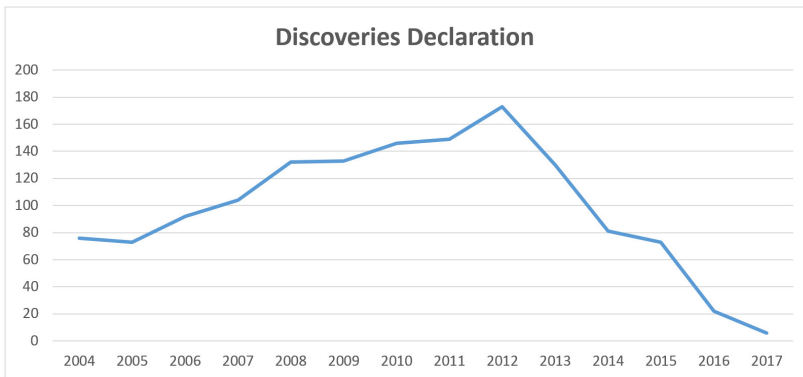
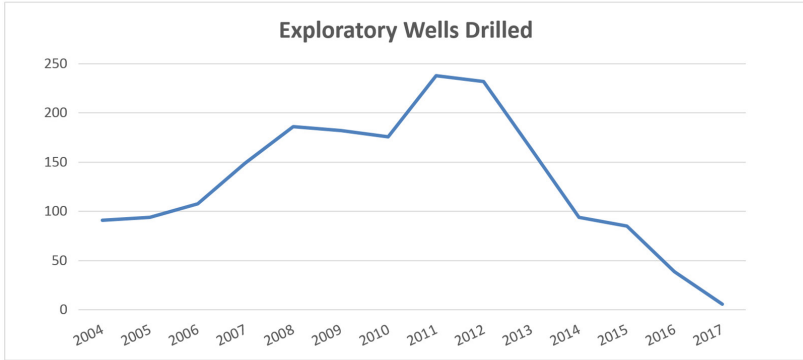
In all these years, the contracts signed have always been respected. The regulation is guaranteed by an autonomous regulatory agency: the National Agency of Petroleum, Natural Gas and Biofuels (ANP).

It is important to mention that the National Energy Policy Council (CNPE) formulates policies pertaining to hydrocarbons and biofuels and ANP is responsible to implement those policies.

2. Opportunities

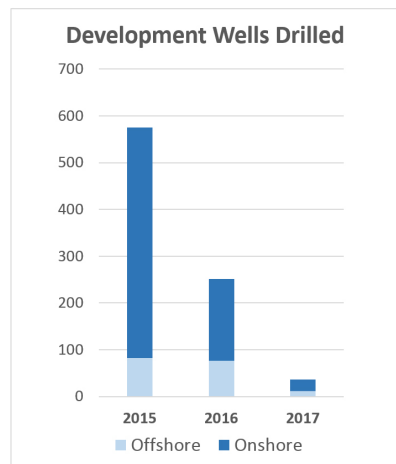
Despite the production growth, there is still an immense potential yet to be explored. Less than 5% of the sedimentary basins areas were granted and the number of wells drilled in Brazil is very low if compared to other countries - only about 30,000 wells - half of what Argentina has already drilled and only a fraction of the millions of wells drilled in the U.S.A. There are still two entire sedimentary basins without a single well drilled (Pernambuco/Paraiba and Madre di Dios basins).

On the other hand, for five years - between 2008 and 2013, while discussing a new regulatory model for the pre-salt - no round was held. In addition to the collapse in the oil price, there was a significant reduction in the exploratory activity and, consequently, the number of discovery declarations was reduced in the recent period. The number of development wells drilled also decreased.



* Up to 08/06/2017

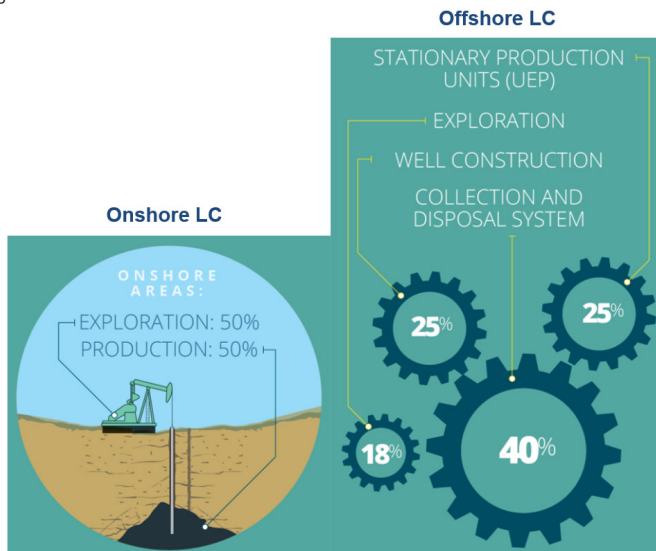
The situation should change radically in the coming years. The O&G sector is going through the greatest transformation since the foundation of Petrobras in 1953. For the first time ever, the National Energy Policy Council (CNPE) has approved a bidding rounds calendar. Nine new bidding rounds are planned for 2017-2019, offering acreages containing billion barrels of oil in place and creating opportunities for all types of exploration and production companies. In 2017, three auctions are confirmed: the 14th bidding round with blocks under concession regime and the 2nd and 3rd production sharing bidding round, with blocks in the pre-salt area - among the most attractive exploration opportunities available in the world.



Future Bidding Rounds		Focus	Date
2017	14 th Bidding Round	East Margin and Onshore Basins	27 th September
	2 nd Production Sharing Bidding Round	Gato do Mato, Carcará, Sapinhoá and Tartaruga Verde	27 th October
	3 rd Production Sharing Bidding Round	Peroba, Pau Brasil, Alto de Cabo Frio Oeste and Alto de Cabo Frio Central	27 th October
2018	15 th Bidding Round	Equatorial Margin and Onshore Basins	May, 2018
	4 th Production Sharing Bidding Round	Saturno, Três Marias, Uirapuru, C-M-537, C-M-655, C-M-657 and C-M-709	May, 2018
	5 th Marginal Fields Bidding Round	To be defined	To be defined
2019	16 th Bidding Round	East Margin and Onshore Basins	3 rd Q 2019
	5 th Production Sharing Bidding Round	Aram, Bumerangue and SE Lula, South and SW Júpiter	3 rd Q 2019
	Marginal Fields Bidding Round	To be defined	To be defined

It is important to mention that the new E&P policies establish an open acreage licensing policy: a permanent offer of relinquished areas and areas that were approved by CNPE in the past but were not contracted. With this initiative, ANP estimates that hundreds of areas will be offered again to the market, starting in 2018.

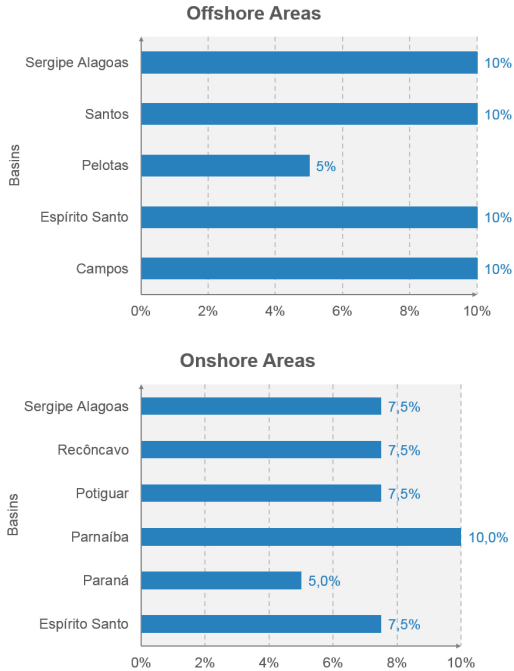
In addition, improvements in the Energy Policy and regulation are in progress. A new local content policy for the 2017 bidding rounds was issued and private companies can now operate blocks in the pre-salt polygon.



Source: Ministry of Mines and Energy (MME) – New Local Content required for the 14th bidding round

For the 14th bidding round, the rules for the concession regime were simplified, with innovations such as the adoption of the single exploration phase, distinct royalties for the new frontier areas and mature basins of greater risks, reduction of the minimum net equity for non-operators, and incentives to increase the participation of investment funds.

Royalties rate reduction in order to encourage activities



There are also ongoing government programs to attract new investments in the upstream, natural gas and downstream sectors:

- REATE (Onshore revitalization)
- Gás para Crescer (Gas to Grow)
- Renovabio (Biorenewables)
- Combustível Brasil (Brazil Fuel)

Additionally, Petrobras is implementing a divestment plan, which includes E&P, downstream and natural gas assets.

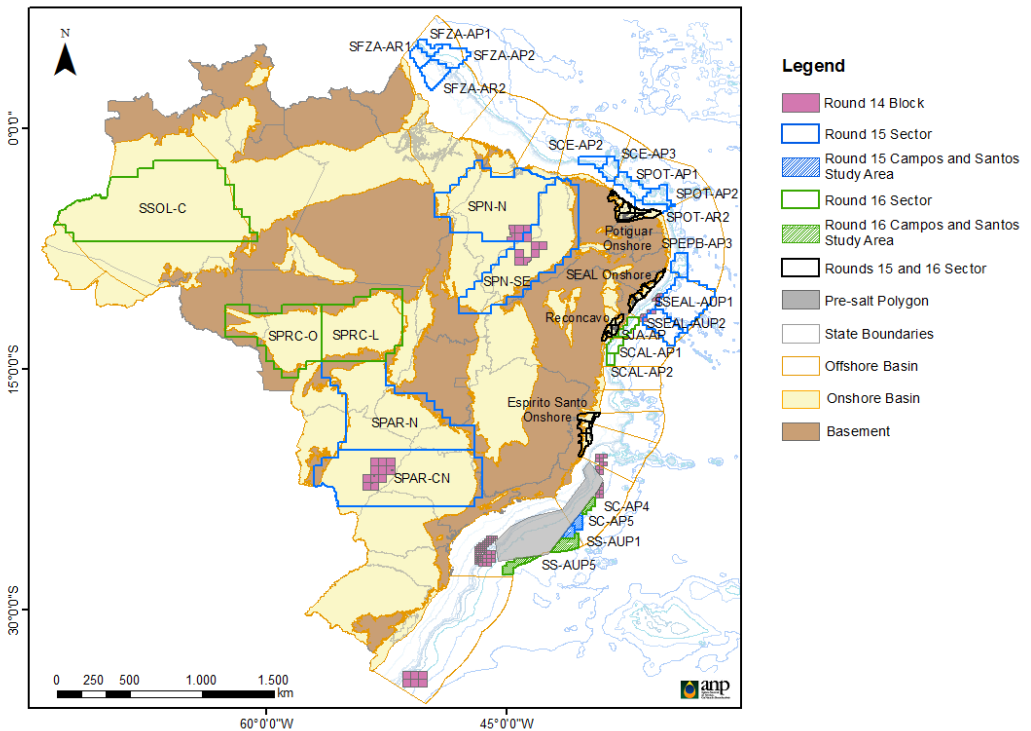
Companies interested in investing in E&P, in downstream, in the natural gas sector, in the supply chain and in the service industry in Brazil have the largest window of opportunity in decades.

3. Next Bidding Rounds

3.1 Concession Bidding Rounds

Three new concession-bidding rounds are planned between 2017 and 2019: the 14th, 15th and 16th Bidding Rounds.

The map below shows the blocks defined for the 14th bidding round and the sectors under studies for the following concession bidding rounds. It is important to mention that other areas can be nominated by companies for the 15th and the 16th bidding rounds.



3.1.1. 14th Bidding Round

The 14th Bidding Round, authorized by Resolution No. 6/2017 of the National Energy Policy Council (CNPE) includes areas in high potential offshore basins, new frontier basins and mature basins.

A total of 287 blocks, located in 29 sectors of 9 Brazilian sedimentary basins, will be offered. From that total, 110 blocks are located in the offshore basins of Sergipe-Alagoas (SEAL), Espírito Santo, Campos, Santos and Pelotas; 23 are located in the new frontier onshore basins of Parnaíba and Parana; and 154 blocks are situated in mature onshore basins of Reconcavo, Potiguar, Sergipe-Alagoas and Espírito Santo.

Among the basins included in the 14th Licensing Round, Sergipe-Alagoas, Campos, Santos and Espírito Santo basins stand out.

For the SEAL basin are expected light oil and condensate discoveries in Upper Cretaceous turbidite reservoirs analogous to the great discoveries from the last few years in this same basin (Barra, Cumbe, Moita Bonita, etc).

Espirito Santo, Campos (AP1 sector), Santos e Pelotas hold great anticipation for oil discoveries in Upper Cretaceous turbidite reservoirs.

The AP3 sector in Campos Basin includes prospective areas in the pre-salt play outside the pre-salt polygon.

The onshore new frontier areas (Parana and Parnaiba basins) are gas prone basins, with good prospectivity.

Offshore Basins

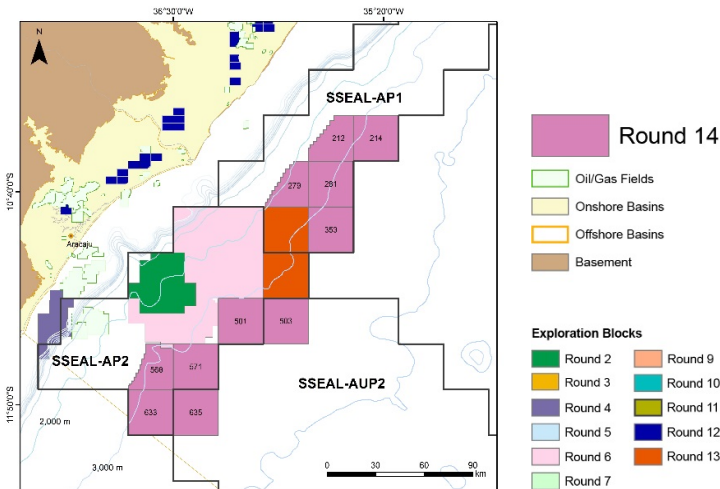
Sergipe-Alagoas Basin (Sectors SSEAL-AP1, SSEAL-AP2 and SSEAL-AUP2)

Sergipe-Alagoas (SEAL) basin is a traditional oil and natural gas producer onshore and offshore (shallow waters).

In the last few years, new oil discoveries were made in Upper Cretaceous turbidite sandstone reservoirs located in deep and ultra deep waters.

The blocks on offer have potential for light oil, natural gas and condensate discoveries in the same play of Barra, Farfan, Cumbe, Moita Bonita, Muriu and Poço Verde discoveries.

Albian-cenomanian-turonian marine shales source rocks with accumulation in Upper Cretaceous turbidite reservoirs characterize the accumulation model of these discoveries.

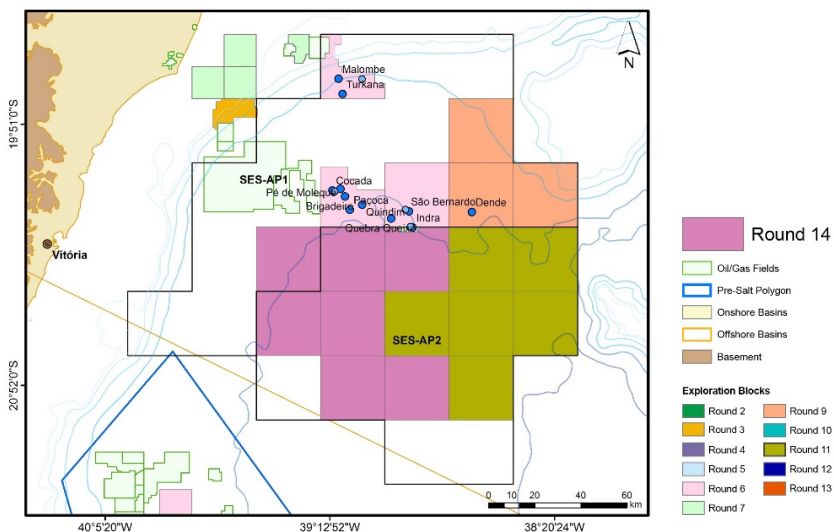


Offshore Espirito Santo Basin (Sectors SES-AP1 and SES-AP2)

The offshore Espirito Santo Basin is a traditional producer of oil and natural gas on shallow and deep waters (Golfinho Complex).

Currently, seven Discoveries are under assessment (Dogs Cluster and Candies Cluster) within the blocks under concession. These discoveries are characterized by Upper Cretaceous to Neogene turbidite reservoirs.

The areas on offer have potential for oil discoveries similar to those of Dogs Cluster and Candies Cluster (Evaluation Plans in progress). They also have potential for oil discoveries in stratigraphic traps very similar to the Marlim Sul field in Campos Basin. In one of these turbidities we have identified a very clear flat spot.

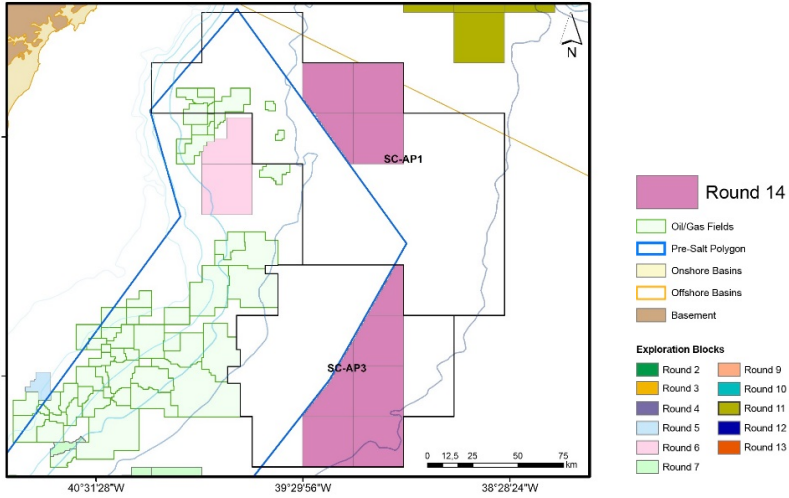


Campos Basin (Sectors SC-AP1 and SC-AP3)

Campos Basin is the main producer of oil and natural gas in Brazil especially in post-salt sandstone turbidite reservoirs (Marlim complex) and in albian carbonate rafts. In 2016, Campos Basin produced 1.5 million barrels of oil per day and around 27 million of natural gas per day.

Besides the post-salt plays, there are important discoveries in the pre-salt play (ex. Whale Cluster) as well.

The SC-AP1 sector has potential for oil discovery in turbiditic reservoirs from the Late Cretaceous to the Paleogene, while the SC-AP3 sector has potential for discoveries in the Aptian carbonates from the pre-salt play.

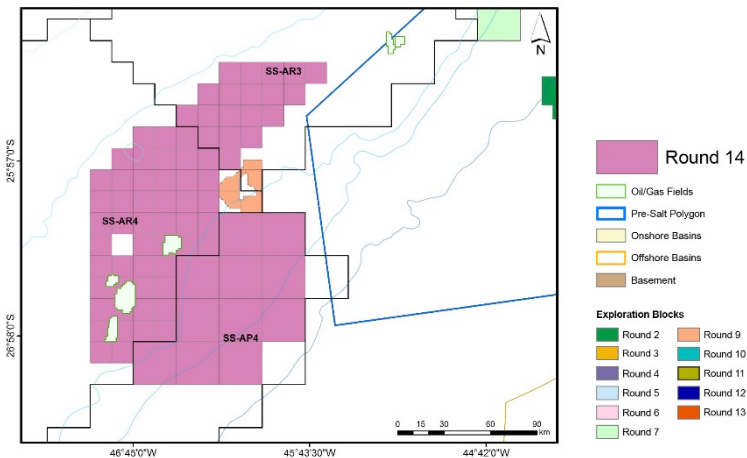


Santos Basin (Sectors SS-AR3, SS-AR4 and SS-AP4)

Santos Basin is one of the most important oil producers in Brazil due to the huge and prolific deposits of the pre-salt. However, the areas on offer in the 14th Round are located outside the pre-salt polygon.

The area on offer has potential for oil discoveries in turbiditic reservoirs from the Late Cretaceous to the Paleogene, similar to those from the Bauna field (2016 average oil production ~ 46 thousand barrels per day).

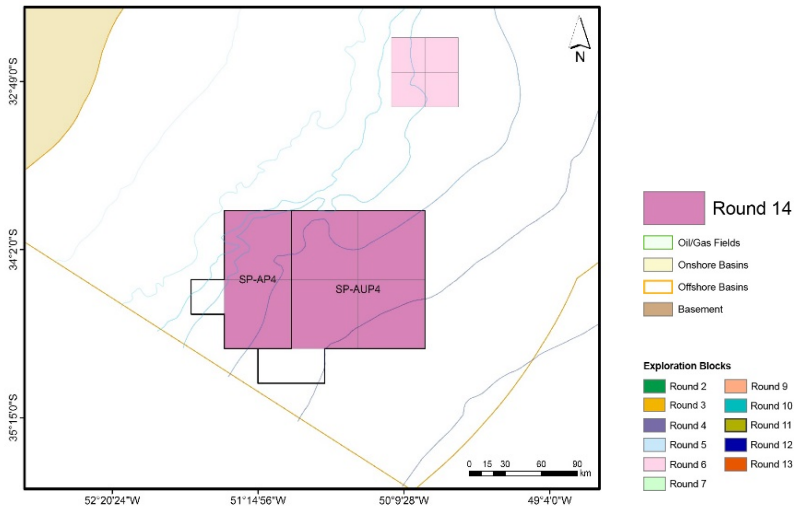
It is a window of opportunity considering that it has been 10 years since the last time ANP offered areas in the shallow water of Santos Basin.



Pelotas Basin (Sectors SP-AP4 and SP-AUP4)

Located in the extreme south of Brazil, along the border of Uruguay, Pelotas Basin is a new frontier basin, still poorly explored and with no discoveries so far.

Pelotas Basin is characterized by a significant thickness of sediments, with prospectivity in the Upper Cretaceous turbidite play.



New Frontier Onshore Basins

Parnaíba Basin (Sectors SPN-N and SPN-SE)

Parnaíba Basin is a gas prone basin located in the northeast of Brazil, covering an area of about 600,000 km².

The basin has three fields of natural gas in production and another four in the development phase in Hawk Cluster. The currently Hawk Cluster gas production capacity is around 8 million m³ per day.

The accumulation model is marked by the presence of diabase sills acting as catalysts for the generation of petroleum and also as seals for the accumulations.

Despite the exploration success achieved in paleozoic basins around the world, hydrocarbon exploration remained stagnant in Parnaíba Basin for decades. Investments made by the Agency and the concessionaires have raised Parnaíba Basin to the category of natural gas producer, and it is the second largest producer in Brazil, responsible for about 5% of all natural gas production in the country (2016).

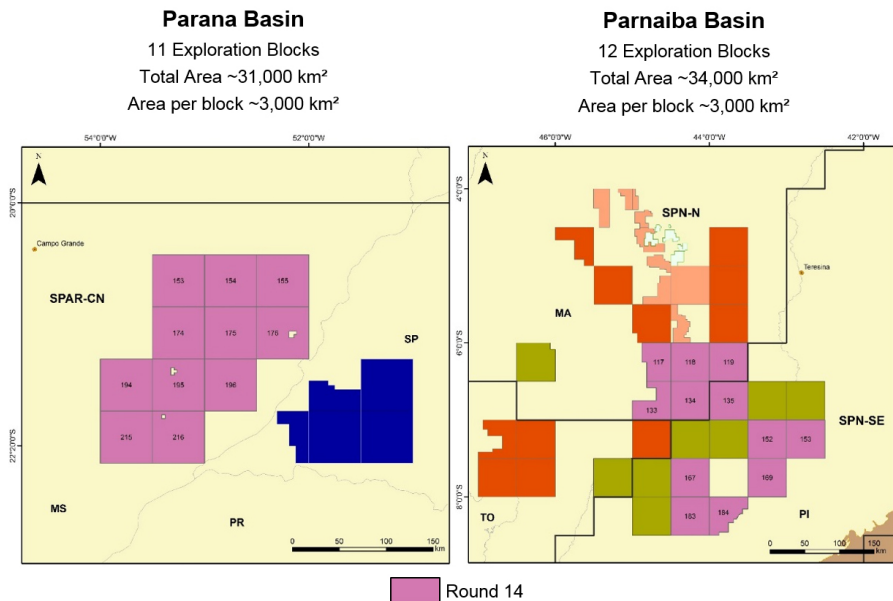
Parana Basin (Sector SPAR-CN)

Parana Basin is located in a very attractive geopolitical context, in the most industrialized region of South America. It does not have any commercial discoveries yet. However, it has a promising potential for natural gas accumulations.

The expected play is similar to that of the Hawk Cluster in Parnaiba Basin, with diabase sills controlling natural gas accumulations.

Petroleum systems evidences are the oil and gas shows in wells drilled in the basin and the discovery of Gas Barra Bonita Gas Field (still in development phase).

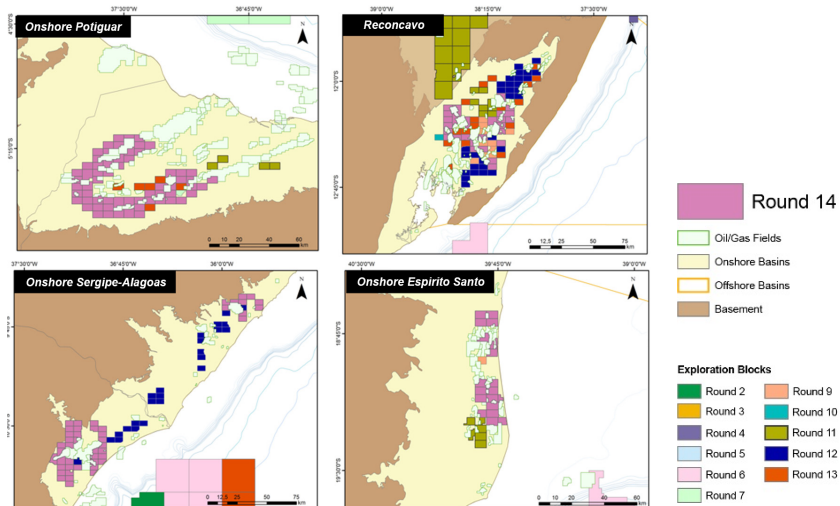
The major difficulty related to the exploration of the Parana Basin was overcoming the issues of imaging below the thick and complex basalt layers. However, very recent seismic data acquired by ANP in Parana basin has achieved impressive results. Now we can map many stratigraphic horizons as well as intrusive rocks and even the basement.



Mature Basins

The onshore portion of Potiguar, Sergipe-Alagoas, Espirito Santo and Reconcavo basins form the Cretaceous rift system, whose origin is related to the crustal stretching process. It resulted in the disruption of the Gondwana Supercontinent, and culminated in the separation between the South American and African plates and the formation of the Atlantic Ocean. These basins are classified as mature, that is, regions in advanced stage of exploration, with well-developed infrastructure and specialized local workforce.

The offer of exploratory blocks in mature basins in the 14th Bidding Round is aimed at presenting opportunities to small and medium-sized companies. In 2016, these onshore basins produced around 126 thousand barrels of oil per day and 4 million m³ of gas per day.



3.1.2 15th Bidding Round

The 15th Licensing Round will focus on the Brazilian Equatorial Margin, which has potential for oil discoveries in Upper Cretaceous Turbidite reservoirs very similar to those in West Africa (Jubilee, Tweneboa, Mahogany, etc).

Besides the equatorial Margin basins, the 15th Licensing Round will include areas in Campos and Santos Basin (the main oil producers in Brazil) outside the Pre-salt polygon.

The onshore new frontier areas (Parana and Parnaiba basins) are gas prone basins, with good prospectivity. Parnaiba basin is responsible for more than 5% of all Brazilian gas production. Parana basin is still barely explored, particularly due to the difficulties of seismic imaging in the region; nonetheless recent data acquired by ANP has shown leads very similar to those in Parnaiba Basin.

3.1.3 16th Bidding Round

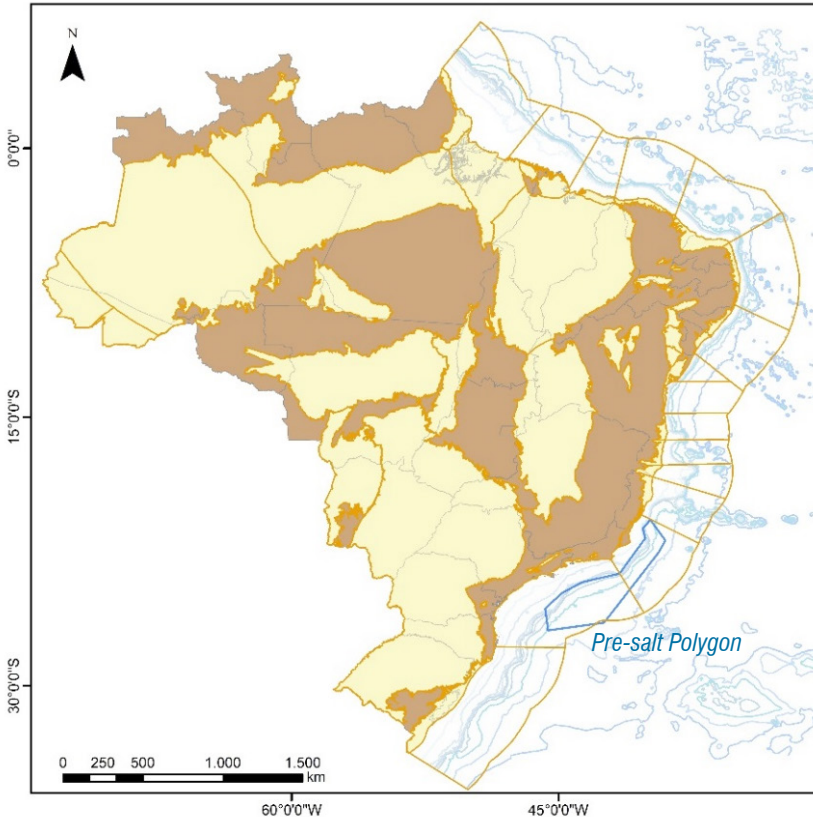
The 16th Licensing Round will focus on the Brazilian East Margin, which is distinguished by its producing basins and its oil and gas-prospective exploration areas.

Areas from Jacuipé, Camamu-Almada, Campos and Santos Basins will be available in this 16th Licensing Round.

This bidding round also include areas in onshore new frontier areas (Solimoes e Parecis). Parecis Basin has potential for gas discoveries, while Solimoes Basin is on oil and gas producer, responsible for 13% of the national gas production (2016).

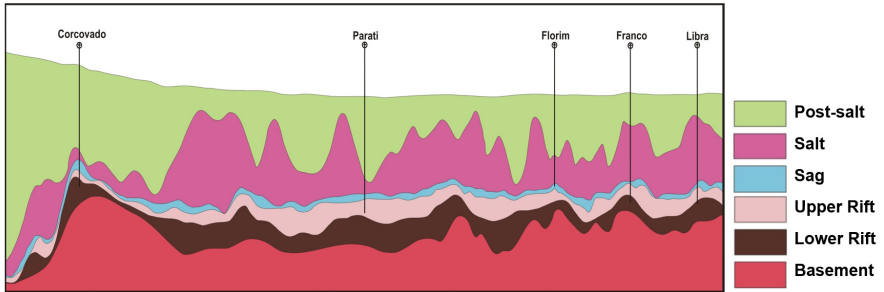
3.2 Production Sharing Bidding Rounds

Four production sharing bidding rounds are planned up to 2019, offering 18 exploration areas in the pre-salt polygon.



3.2.1 The Pre-salt play

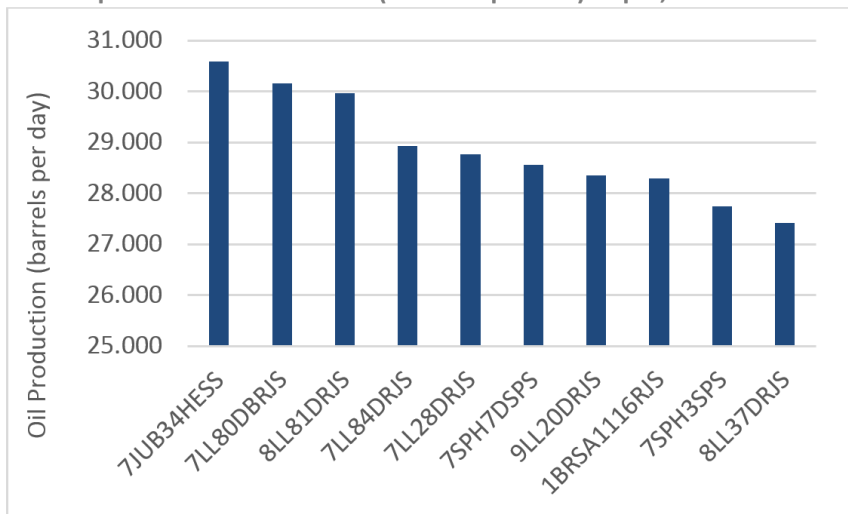
The Pre-salt is a sequence of sedimentary rocks created by the separation of the ancient Continent of Gondwana. Initially, great depressions were formed between the two continents, giving rise to large lakes that allowed the deposition of the source rocks. The continuity of the process lead to the deposition of the reservoir rocks in the upper rift and sag phases, and the thick layers of salt.



The region of the Pre-salt polygon is distinguished by the presence of thick salt layers, mainly in Santos Basin, where the salt walls occur, which allowed a very efficient seal and provided the appropriate thermal conditions for the preservation of liquid hydrocarbons. This region includes the large structures with accumulations already discovered in the Pre-salt interval.

The potential pre-salt resources in the polygon (contracted area + four rounds) is more than 30 billion barrels. With high quality reservoirs, large structures and 27 API in average, the pre-salt reservoirs are among the best opportunities in the world. The geological success rate in the pre-salt is around 46%. Nowadays, pre-salt production accounts for 47% of Brazil's oil production. There were 75 wells in production in April 2017. In Santos Basin, in the same month, there were 9 production units and 20 more are expected only for the contracted area. The 10 top oil wells in April were producing from the pre-salt, and the average productivity is around 30,000 barrels per day. New technologies as bigger flowlines will lead to productivity above this average.

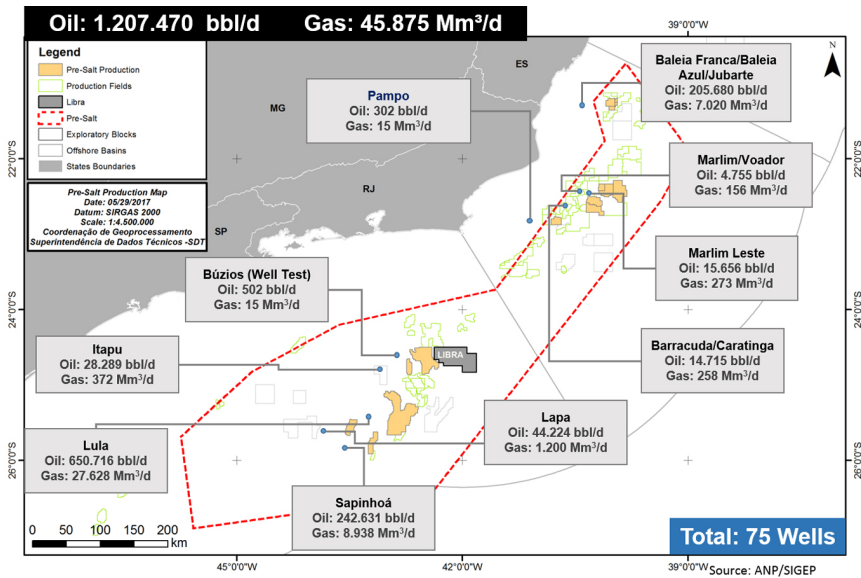
Top 10 Oil Producers Wells (all in the pre-salt) - April, 2017



Pre-salt production (boepd)

2014	0.60 million
2015	0.95 million
2016	1.27 million
2017	1.54 million

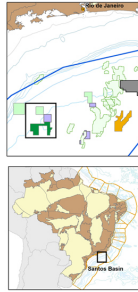
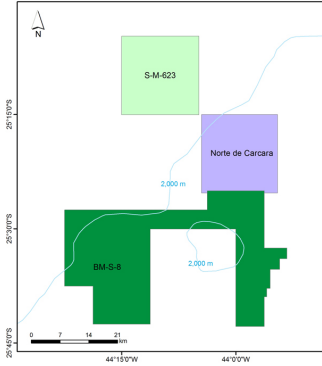
Pre-salt production per field - April, 2017



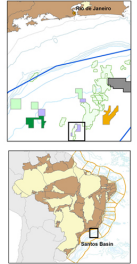
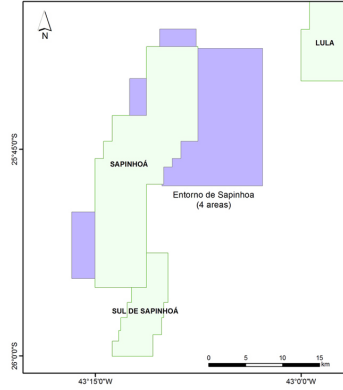
3.2.2. 2nd Pre-salt Bidding Round

The 2nd Production Sharing Licensing Round will be focused on unitizable areas inside the pre-salt polygon, in Campos and Santos Basins. The areas include three prospects in the pre-salt play of Santos basin (North of Carcara, South of Gato do Mato and the Surroundings of the Sapinhoa field) and one prospect in the Albian Carbonates (post-salt play) in Campos Basin (southwest of Tartaruga Verde field).

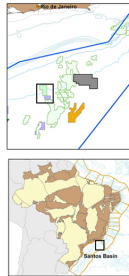
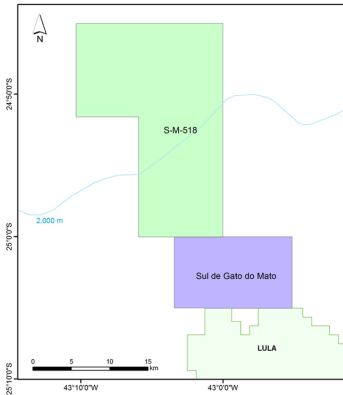
Carcara



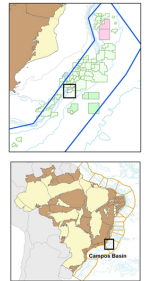
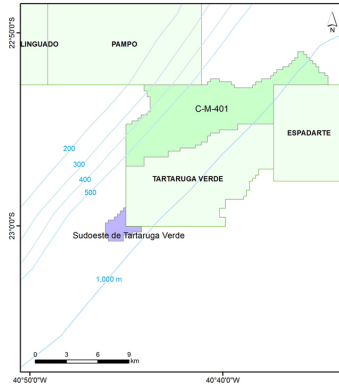
Sapinhoa



Gato do Mato



Tartaruga Verde



Legend

- 2ª Pre-Salt Bid Round
- Oil/Gas Fields
- Pre-Salt Polygon

- Onshore Basins
- Offshore Basins

Exploration Blocks - Bid Rounds

- | | | | |
|--|---|---|---|
| 2 | 5 | 9 | 12 |
| 3 | 6 | 10 | 13 |
| 4 | 7 | 11 | Libra |

Carcara Prospect

Carcara prospect is partially located in Block BM-S-8, extending to non-contracted area. It is a prominent four-way closure trap structure well defined and structured by NE-SW faults. About half of the prospect is located in non-contracted area.

The prospect consists of accumulation of light oil and gas in reservoirs composed of fractured aptian microbial carbonates sealed by layers of salt. Characteristically, Carcara structure presents the largest reservoir column with oil within the pre-salt play and excellent porosity and permeability properties.

Estimated in place volumes in Carcara prospect are around 2.2 billion barrels of oil (considering only the area on offer, i.e. the external portion of the contracted area)

Gato do Mato Prospect

Gato do Mato prospect is partially located in Block S-M-518, extending south to a non-contracted area. It is an elongated NS structure with a well defined structural closure.

The structure contains light to very light oil and gas in aptian carbonate reservoirs, with microbial characteristics, sealed by a thick layer of evaporites.

Sapinhua Field

Sapinhua Field is located in the central portion of the Santos Basin, approximately 360 km off the coast of Sao Paulo State and 290 km from the city of Rio de Janeiro, in a water depth of about 2,000 meters.

The reservoirs producing in the field of Sapinhua are Aptian rocks, composed of microbial carbonates and coquinas. The seal consists of layers of salt up to 2,000m thick.

The reservoirs have excellent porosity and permeability properties, which give the field a high productivity, with great recovery efficiency of hydrocarbons.

Petrobras has exercised preferential bidding rights in Sapinhua area, guaranteeing itself an operating stake of at least 30%.

Tartaruga Verde Field

Tartaruga Verde field is located in the southern portion of the Campos Basin, approximately 125 km from the municipality of Macae / RJ, in a water depth between 650 and 1,200 m. First oil is expected for this year.

Unlike the prospects seen in the Santos Basin, the reservoirs identified in the Tartaruga Verde field area correspond to the Albian platform carbonatic rocks of the post-salt play. The Quissama Formation consists of oolitic and oncolytic limestones and dolomites (Buzios member). The Outeiro and Imbetiba formations compose the seal for the reservoir of the structure.

The accumulation occurs in structures of albian rafts type, generated by the sliding of the layers of evaporites that occurs beneath the carbonates.

3.2.3. 3rd Pre-salt Bidding Round

The 3rd Production Sharing Licensing Round include four blocks in the pre-salt play of Santos and Campos Basins (Peroba, Pau Brasil, Central Cabo Frio High and West Cabo Frio High).

Petrobras has exercised preferential bidding rights in Peroba and Cabo Frio Central areas, guaranteeing itself an operating stake of at least 30%.

Peroba and Pau Brasil

The Peroba and Pau Brasil prospects are two prominent four-way closure trap structures. Peroba is located south of Lula field, the most productive field in Brazil.

Estimated unrisks in place volumes for both Peroba and Pau Brasil prospects are around 9.4 billion barrels of oil.

The prospects consists of aptian microbial carbonates reservoirs sealed by layers of salt. The prospectivity is indicated by seismic data, where the seismic facies indicate the occurrence of reservoir, similar to those in prolific Pre-salt structures (Lula, Sapinhua, Libra, Buzios, etc).

Cabo Frio High Blocks

The 3rd pre-salt licensing round includes two blocks in the Cabo Frio High (Alto de Cabo Frio Central and Alto de Cabo Frio Oeste), a basement high that separates Campos and Santos basins. It is a very prominent structural high that forms an extensive plateau with very complex geology.

Specifically in the two blocks on offer no well has been drilled yet. Nonetheless, the seismic data indicates the presence of oil kitchen, reservoir and seal. Furthermore, the seismic facies in this area are very similar to those found in the reservoirs of prolific Pre-salt structures in Santos Basin (Lula, Buzios, Sapinhua, etc).

3.2.4. 4th Production Sharing Bidding Round

The 4th Production Sharing Licensing Round includes three areas in the Pre-salt play in Santos Basin: Saturno, Tres Marias and Uirapuru.

Saturno and Uirapuru are very prominent four way closure structures and have potential for huge discoveries.

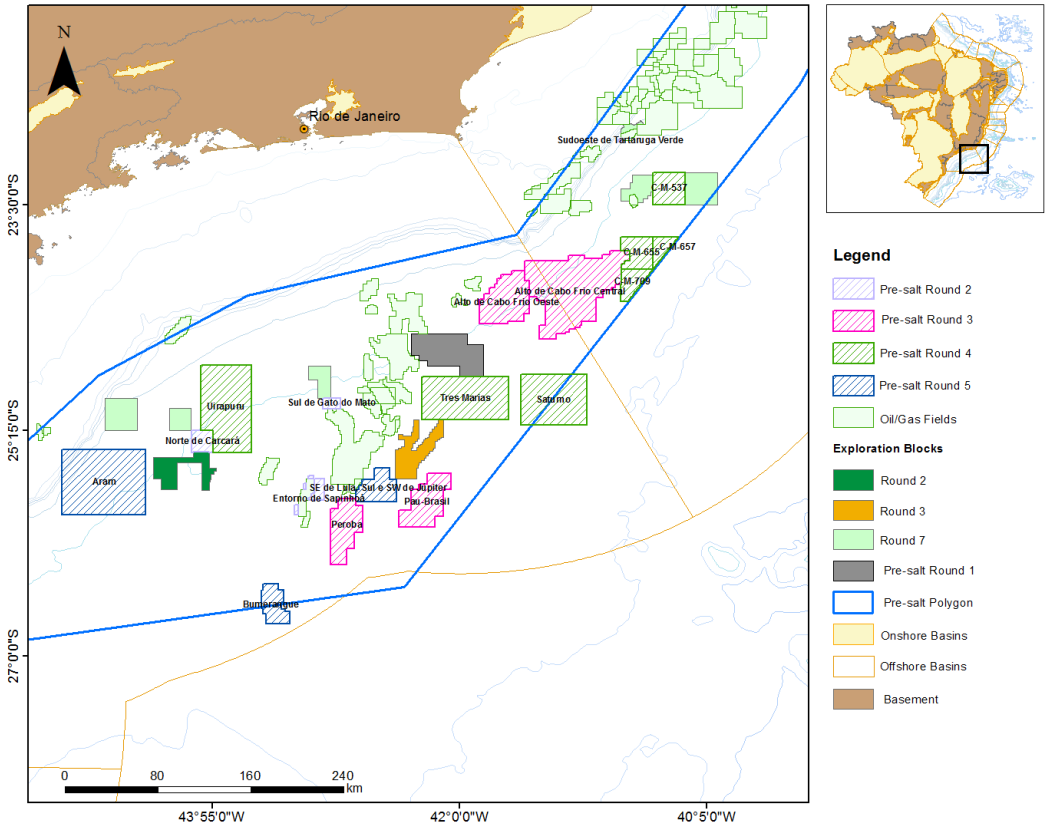
Tres Marias Area includes three smaller scale structures when compared to Saturno and Uirapuru, and are located at the south of Libra.

3.2.5. 5th Production Sharing Bidding Round

The 5th Production Sharing Licensing Round includes three blocks in the pre-salt play of Santos Basin: Aram, Bumerangue and SE de Lula, Sul e SW de Jupiter.

Aram is a very large four-way closure structure and has potential for a giant oil discovery. SE de Lula, Sul and SW de Jupiter area includes smaller scale structures located between Lula Field and Jupiter prospect. Bumerangue is a prominent basement high in four-way closure trap located at the south-western border of the Pre-salt polygon.

Blocks on offer in the Production Sharing Bidding Rounds



4. Potential results

The numbers below show the potential results expected for the upcoming bidding rounds.

US\$ 80 billions in new investments	+ 10 billion bbl of Recoverable Volumes
+ 300 offshore wells	+ Up to 20 drilling rigs working simultaneously
+ 17 new production units	+ 1,100 km of flowlines
+ 600 km of gas pipelines	+ 2 million bpd in 2027

5. Conclusions

The next 3 years will be historical for the Brazilian oil and gas sector. In 2017, three new bidding rounds are confirmed for September and October. Six more bidding rounds are planned for 2018 and 2019. The new bidding rounds create opportunities for all types and profiles of exploration and production companies. For the first time ever, there are relevant opportunities in the natural gas and downstream sectors too.

Brazil is experiencing the greatest transformation that the oil and gas sector has ever had. It will lead to a diverse and competitive market. Companies interested in Brazil have the largest window of opportunity in decades.

More information on
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