Summary of areas under study
INTRODUCTION

The CNPE Resolution 005/2016, issued on 10/13/2016, authorized the accomplishment of the technical studies with a view to the 14th Bidding Round.

In addition, at the CNPE meeting held on 12/14/2016, another 2 sectors were included in the Campos Basin to carry out technical studies.

In all, 29 sectors of 9 sedimentary basins will be studied (Figure 1): the sea basins of the East Bank (Sergipe-Alagoas, Espírito Santo, Campos, Santos and Pelotas), the Terrestrial basins of Nova Fronteira (Paraná and Parnaíba) and the terrestrial mature basins (Potiguar Land, Recôncavo, Sergipe-Alagoas Land and Espírito Santo Land).

Figure 1. Sectors under study for the ANP’s 14th Bidding Round of Petroleum and Gas Bidding.
The basins and sectors under consideration aim to meet the guidelines of the Federal Government to conduct bidding for concession blocks including new frontier basins, mature basins and high potential basins to promote increased geological knowledge of Brazilian sedimentary basins; Decentralize exploratory investment in the country; Promote the activities of small and medium-sized enterprises; Expand national reserves; To establish national and foreign companies in the country, continuing the demand for local goods and services, the generation of jobs and the distribution of income.

SEDIMENTARY BASINS

Maritime Basins

The Brazilian East Bank will be the focus of the ANP’s 14th Bidding Round, which is characterized by producing basins and by basins with highly promising exploratory potential. Among the basins included in the study, there is the Sergipe-Alagoas Basin, where recently quite significant discoveries were made. Also noteworthy is the inclusion of sectors of the Santos Basin, which has not figured in the ANP’s bids since 2007, that is, almost 10 years ago.

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

The Sergipe-Alagoas Basin is located on the continental margin of northeastern Brazil, covering part of the states of Sergipe and Alagoas. On the map, it has an elongated NE direction 350 km long and 35 km wide average earth. Its maritime portion presents an area of 31,750 km² up to the bathymetric quota of 3,000 m. It is limited to the north by the Alto de Maragogi, with the Pernambuco-Paraíba Basin and, to the south, has its geographical limit with the Jacuípe Basin represented by the Estancia Platform in the emersa portion and by the Vaza-Barris fault system in the Oceanic portion. The western boundary, with precambrian crystalline basement, is marked by distension fault systems and associated structures. The internal boundary between the sub-basins of Sergipe and Alagoas is given by Alto de Jaboatã-Penedo.

Summary of the areas under study
Currently, the maritime portion of the Sergipe-Alagoas Basin has nine oil and / or natural gas fields. Of these, eight are in the production phase and one in the development phase. There are 11 blocks under concession in the Sergipe-Alagoas Basin, all in the Sergipe sub-basin (Figure 2).

Figure 2. Location map of the sectors under study in the Sergipe-Alagoas Sea Basin for the 14th Bidding Round.
Of the eleven concession blocks, eight have discovery evaluation plans in progress (PAD - see Figure 2). These PADs refer to the findings of light oil in Cretaceous turbidites identified in deep and ultra deep waters of the basin, which revealed a new exploratory model of success for the region. The recent discoveries of Barra, Farfan, Muriú, Moita Bonita, Poço Verde and Cumbe open a new exploratory play for this basin, making it a very attractive target for the oil companies.

Espírito Santo Sea Basin (Sector SES-AP1 and SES-AP2)

The maritime portion of the Espírito Santo Basin is located on the eastern continental margin of the Brazilian territory, occupying an area of approximately 100,000 km². It is limited to the north with the Mucuri Basin (geographical limit), which in turn is bordered by the Cumuruxatiba Basin by the Abrolhos Volcanic Complex. To the South, the Espírito Santo Basin is bordered by the Campos Basin by the Alto de Vitória.

The marine portion of the basin has six fields in the production phase (Dolphin Complex) and thirteen exploratory blocks under concession (Figure 3). Of these thirteen blocks, seven have ongoing Discovery Assessment Plans (PAD) in progress (the Parque dos Cachorros and the Parque dos Doces).
These findings are characterized by Neo-Neoplastic turbidite reservoirs to Neogene in structural, stratigraphic and mixed traps. In sectors in studies, characterized by compressional tectonism and the movement of salt layers, similar accumulations are expected from those of the Parque dos Cachorros and Parque dos Doces, as well as accumulations of oil in the sub-salt play, analogous to the play of the prolific producing fields in the Gulf of Mexico.
Campos Basin (Sector SC-AP1 and SC-AP3)

The Campos Basin, located on the coast of the States of Rio de Janeiro and Espírito Santo, occupying an area of approximately 96 thousand km² in the sea up to the bathymetric quota of 3,000 m. It is limited to the north with the Espírito Santo Basin by the Alto de Vitória and, in the South, the basin is limited with the Santos Basin.

The performance of the basin's oil system can be considered extremely efficient. The interaction of the elements of the petroleum system resulted in an ideal timing of hydrocarbon generation, migration and trapping of hydrocarbons in the basin and, consequently, in the accumulation and discovery of significant volumes of oil and gas.

Currently, the Campos Basin accounts for approximately 50% of Brazilian oil and natural gas production, totaling approximately 1.65MM boe / d.

For this Bidding Round, blocks will be offered in the Sectors SC-AP1 and SC-AP3, located in deep waters (Figure 4).

The SC-AP1 Sector is located in the northern portion of the Campos Basin. In the NW portion of the sector, there is a discovery pole, known as Parque das Baleias. This pole is currently composed of an area of production, formed mainly by the fields of Jubarte, Cachalote, Baleia Franca, Baleia Anã and Baleia Azul.

The SC-AP3 Sector is located in the northeast portion of the Campos Basin. Its status of high potential is fully justified by the vicinity of the three large giant fields of the basin: Marlim, Albacora and Roncador.
Figure 4. Location map of the sectors under study in the Campos Basin for the 14th Bidding Round.
Santos Basin (Sector SS-AR3, SS-AR4 and SS-AP4)

The Santos Basin is located in the Brazilian continental platform. It extends from the southern coast of the State of Rio de Janeiro to the north of the State of Santa Catarina, making area of 300,000 km2 order to bathymetric quota of 3,000 m. It is limited to the north by the Campos Basin, by Alto de Cabo Frio and, to the south, by the Pelotas Basin by the Alto de Florianópolis. It is a basin of divergent margin, formed by the opening of the South Atlantic, initiated in the Lower Cretaceous.

In the Santos Basin are located numerous oil fields in production and large deposits to be explored, including post-salt and pre-salt reservoirs.

The Santos Basin has not been included in ANP bids since the beginning of the discussions to build the new pre-salt regulatory framework, and was last bid on the Agency's 9th Bidding Round, held in 2007.

Currently, it has 11 exploratory blocks in concession and 1 in a sharing regime, which together amount to a little more than 5,600 km2 of concession area, and therefore, it is necessary to offer new exploratory blocks.

The areas under study for the 14th Bidding Round are located outside the pre-salt polygon and have potential for accumulations in post-salt plays (Figure 5). Accumulations are expected in turbidite reservoirs deposited from the Neocrotaceous to the Paleogene, analogous to the Baúna field.
In addition, the region selected for study, predominantly in shallow waters, is particularly attractive, since it requires investments of lower financial size, favoring and encouraging the sector’s activities in the current world oil scenario marked by the fall in the price of the barrel of the oil.

Figure 5. Location map of the sectors under study in the Santos Basin for the 14th Bidding Round.

Summary of the areas under study
Pelotas Basin (Sector SP-AP4 and SP-AUP4)

The Pelotas Sedimentary Basin is located at the southern end of the Brazilian continental margin, and its submerged portion occupies, up to the territorial limit of 200 nautical miles, an area of 346,873 km². In Brazil, the basin extends from the Alto de Florianópolis, to the North, the geological boundary with the Santos Basin, to the geographical border with Uruguay, to the South. In the neighboring country, the basin continues to Alto de Polônio, which separates it geologically from the Punta del Este Basin. The sediment thickness in the Pelotas Basin reaches over 9,000 meters.

The Pelotas Basin constitutes a large unexplored area, with only four exploratory blocks under concession. However, it has indications of an active petroleum system (generating rocks and hydrocarbons) and reservoirs (identified in seismic).

The sectors under study in the Pelotas Basin with a view to the 14th Bidding Round are located in deep and ultra deep waters (Figure 6), near the border with Uruguay. For this region, exploratory opportunities are expected, consisting of turbidite reservoirs of the Neocretáceo in stratigraphic traps.
Exploratory blocks located in the Uruguayan portion of the Pelotas Basin and blocks located in the Punta del Este and Plata basins were offered in 2009 and in 2012 in the bidding contest promoted by the Uruguayan Government. It aimed at the exploration and production of oil and natural gas in blocks on the continental platform. At that time, the blocks placed on offer were auctioned and attracted large companies (Petrobras, Tullow Oil, Total, British Petroleum, British Gas, YPF, Murphy Oil, CEPSA, ExxonMobil, Shell among others).

Figure 6. Location map of the sectors under study in the Pelotas Basin for the 14th Bidding Round.

Summary of the areas under study
Recently, the consortium formed by companies Total and Exxon and state-owned ANCAP drilled the first deepwater exploration well in the Uruguayan portion of the Pelotas Basin. The Raya-1 well achieved a record of water depth of 3,410 meters. The aforementioned well did not identify the presence of hydrocarbons. However, such results should not discourage the oil companies interested in the Brazilian portion of the Pelotas Basin, since the Raya-1 well did not test the main expected reservoirs (Cretaceous turbidite sandstones), and was terminated in the Tertiary.

In addition, the Brazilian portion of the Pelotas Basin is characterized by a greater thickness of sediments, increasing its oil potential.

**New Frontier Land Basins**

The New Frontier basins are those whose geological knowledge or technological progress has not yet reached sufficient maturity to reduce the high exploratory risk.

Despite the lower data density and geological knowledge in these basins, many have promising oil potential, with proven oil systems and prolific analog basins. In this sense, the objective of the supply of blocks in new frontier basins is to expand Brazilian exploration areas, attract new investments and add new basins to the group of Brazilian hydrocarbon basins.

In this tunnel, sectors were selected for study with a view to the 14th Bidding Round located in the Paleozoic basins of Parnaíba and Paraná.

In addition, the supply of exploration areas in the Paraná and Parnaíba basins is in perfect harmony with the national energy policy of strengthening the onshore industry and increasing the production of natural gas on land.

**Parnaíba Basin (Sector SPN-N and SPN-SE)**

The Parnaíba Basin is located in the northeastern Brazilian territory, covering an area of about 600 thousand km². It is distributed through the states of Piauí, Maranhão, Pará, Tocantins, Bahia and Ceará.
Despite the exploratory success achieved in similar basins around the world, hydrocarbon exploration has remained stagnant in the Parnaíba Basin for decades. However, in the last decade there was a resumption of activities through the concession of exploratory blocks by the ANP. Investments by the Agency and the concessionaires have raised the Parnaíba Basin to the category of natural gas producer, being currently the second largest producer on land in Brazil, responsible for about 7% of all natural gas production in the country.

The Parnaíba Basin presents a peculiar petroleum system, characterized by the presence of intrusive Jurassic igneous rocks that act as catalysts for the generation of hydrocarbons in the Pimenteiras Formation (Devonian), immature by burial, and for the formation of traps, composed by jumps Sills, with the formation of "coconut hat" structures. The main reservoir rocks occur at the Poti (Carboniferous) and Cabeças (Devonian) formations, but may also occur in the carboniferous sandstones of the Piauí Formation.

This exploratory model is the one registered in the fields of Gavião Real, Gavião Branco and Gavião Vermelho (in production) and in the fields of Gavião Azul, Gavião Preto, Gavião Caboclo and Gavião Branco Norte (in development), plus further more discoveries in evaluation.

The Parnaíba Basin proved its potential as a gas producer, with a consolidated exploratory model for its central portion, around the producing fields. Recent investments such as the construction of a thermoelectric plant and a gas treatment plant demonstrate the excellent economic return for exploration in the region.

Although established as a gas producer in its central portion, the Parnaíba Basin is still very little explored in relation to its wide extension, being able to shelter other possibilities of accumulation models.

For the study area in the State of Maranhão (Figure 7), similar accumulations are expected from those of the Parque dos Gaviões. In the region of the blocks in the State of Piauí, the expected accumulation model includes forced regression sandstones within the Pimenteiras Formation, as well as opportunities related to the graphs formed under the influence of the Transbrasilian Lineament.

Summary of the areas under study
Figure 7. Location map of the sectors under study in the Parnaiba Basin for the 14th Bidding Round.

Summary of the areas under study
Paraná Basin (Sector SPAR-CN)

The Paraná Basin is located in the center-east portion of South America and covers an area of approximately 1,500,000 km², of which 1,100,000 km² are in Brazilian territory.

It houses in its depocenter a sedimentary-magmatic package of the order of 7,000 meters of thickness, including some horizons with characteristics of generating rocks and others with attributes of reservoir.

The Paraná Basin presents numerous exudates of hydrocarbons in the eastern part of the basin and traces of hydrocarbons in several wells drilled, some including oil and / or gas recovery. However, no commercial discovery has been made yet.

It has two proven petroleum systems, the Ponta Grossa - Itararé (PG - It) and Irati - Rio Bonito / Pirambóia (I - RB / P), whose evidences are the gas discoveries that resulted in the discovery of the gas field of Barra Bonita.

For the 14th Bidding Round, the SPAR-CN sector will be studied (Figure 8). The main exploratory objectives in the study area include the Itararé Group's permocarboniferous sandstones and the Permian delta sandstones of the Rio Bonito Formation. The generation occurs in the Devonian shales of the Ponta Grossa Formation, under maturation condition from burial and the intrusive thermal effect. Exploratory opportunities with generation from the intrusive thermal effect on the Irati Formation carbonaceous shales and stratigraphic or mixed traps are not discarded.
Figure 8. Location map of the sector under study in the Paraná Basin for the 14th Bidding Round.

The expected accumulation model is similar to that of the Parque dos Gaviões in the Parnaíba Basin. Accumulations of natural gas are also expected here.

Summary of the areas under study
Mature Basins

The emergent portions of the Potiguar basins, Sergipe-Alagoas Espírito Santo and the Recôncavo basin make up the Cretaceous rift system, whose origin is related to the crustal stretching process that resulted in the disruption of the Gondwana Supercontinent and culminating in the separation between the South American and African plates and the formation of the Atlantic Ocean.

These basins are classified as mature, this is, regions in advanced stage of exploitation, with well-developed infrastructure and specialized local manpower.

The mature basins included in the geological studies for the 14th Bidding Round are aimed at offering opportunities to small and medium-sized enterprises, allowing the continuity of the exploration and production of oil and natural gas in those regions where these activities play an important socioeconomic role.

Potiguar Land (Sector SPOT-T1B, SPOT-T2, SPOT-T4 and SPOT-T5)

The terrestrial portion of the Potiguar Basin is located in the easternmost portion of the northeastern region of Brazil, extending through the states of Rio Grande do Norte and Ceará. The sedimentary area in the emerging portion is 26,700 km2.

Currently the portion emerging from the basin has 81 fields in production, in addition to 13 exploratory blocks in concession. The Potiguar Basin is Brazil’s third largest oil and natural gas producer, contributing with a daily production of 57.68 thousand bbl of oil and 1.1 billion m3 of gas.

For the 14th Bidding Round, the SPOT-T-1B, SPOT-T2, SPOT-T4 and SPOT-T5 sectors are under study in the Potiguar Basin (Figure 9).
Figure 9. Location map of the sector under study in the Potiguar Land Basin for the 14th Bidding Round.

**Sergipe-Alagoas Land Basin (Sector SSEAL-T1, SSEAL-T2, SSEAL-T4 and SSEAL-T5)**

The land portion of the Sergipe-Alagoas Basin is located on the northeast coast of Brazil, covering part of the states of Sergipe and Alagoas. It has a total area of around 13 thousand km².

Currently, the portion emerging from the basin has 31 fields, 28 in the production phase and 3 in the development phase. Of these 31 fields, 19 are located in the Sub-basin of Sergipe and 12 in the Alagoas Sub-basin, in addition to 32 exploratory blocks in concession.

Summary of the areas under study
It is the sixth oil and natural gas producer in Brazil, contributing with a daily production of 32.53 thousand bbl of oil and 3.8 billion m³ of gas.

For the 14th Bidding Round, the SEAL-T1, SEAL-T2, SEAL-T4 and SEAL-T6 sectors are being studied in the Sergipe-Alagoas Land Basin (Figure 10).

Figure 10. Location map of the sector under study in the Sergipe-Alagoas Land Basin for the 14th Bidding Round.

Summary of the areas under study
Recôncavo Basin (Sector SREC-T1, SREC-T2, SREC-T3 and SREC-T4)

The Recôncavo Basin is located in the State of Bahia, in the Northeast Region of Brazil, occupying an area of approximately 11,500 km².

Currently it has 89 fields, of which 81 are in the production phase and 8 are in the development phase, in addition to 71 exploratory blocks under concession. It is the fifth largest producer of domestic oil, and the third largest producer of gas on land, contributing with a daily production of 34.35 thousand bbl of oil and 2.3 billion m³ of gas.

For the 14th ANP Bidding Round, the SREC-T1, SREC-T2, SREC-T3 and SREC-T4 sectors are being studied in the Recôncavo Basin (Figure 11).

Figure 11. Location map of the sector under study in the Recôncavo Basin for the 14th Bidding Round.

Summary of the areas under study
Espírito Santo Land Basin (Sector SES-T4 and SES-T6)

The land portion of the Espírito Santo Basin is located on the coast of the State of Espírito Santo. It has an area of about 11 thousand square kilometers on land.

Currently, the emerging portion of the basin has 48 fields, 47 in the production phase and 1 in the development phase, in addition to 7 exploratory blocks under concession. Its land portion contributes a daily production of 12,17 thousand bbl of oil and 233,35 million m³ of gas. For the 14th Bidding Round, the SES-T4 and SES-T6 sectors are under study in the Espírito Santo Land Basin (Figure 12).

Figure 12. Location map of the sector under study in the Espírito Santo Land Basin for the 14th Bidding Round.

Summary of the areas under study