

# OPPORTUNITIES IN THE BRAZILIAN O&G INDUSTRY AND HIGHLIGHTS FOR THE ENERGY TRANSITION






**Rodolfo Saboia**  
Director-General

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# An unprecedented transformation

We continue to make progress in opening the O&G sector

## E&P



A completely **diverse sector** will emerge from Petrobras Divestment Plan. All onshore and shallow water fields are being sold, as well as some great offshore post-salt concessions.

With new investments in mature fields, development of pre-salt fields, offshore blocks in the exploratory phase, and a calendar of new auctions, Brazil is ready to grow production and take a leading position in the sector.

## Downstream



Half of the Brazilian refining capacity (REFAP • RNEST • REPAR • RLAM • LUBNOR • REGAP • REMAN • SIX) is being sold by Petrobras, paving the way for a **competitive and open refining** and fuel market for the first time ever.

ANP is taking measures to deal with the transition to this new environment and to bring competitiveness to the distribution sector.

## Gas



First-ever **effective opening in the natural gas market** with Petrobras leaving the transport and distribution sectors.

A new legal framework has just been put in place for the gas market (Law 14,134/2021 and Decree 10,712/2021) and a strong regulatory agenda is underway to create opportunities for suppliers, free consumers and distributors. An open season calendar is set for this year.

# Even at challenging times, Brazil's O&G Industry has responded with remarkable resilience

## 2020



### 5% of production growth and exports record

Pre-salt high performance  
Exports of oil and fuel oil with low sulfur content



### 2<sup>nd</sup> Cycle of Open Acreage

Performed in December: 18 areas sold



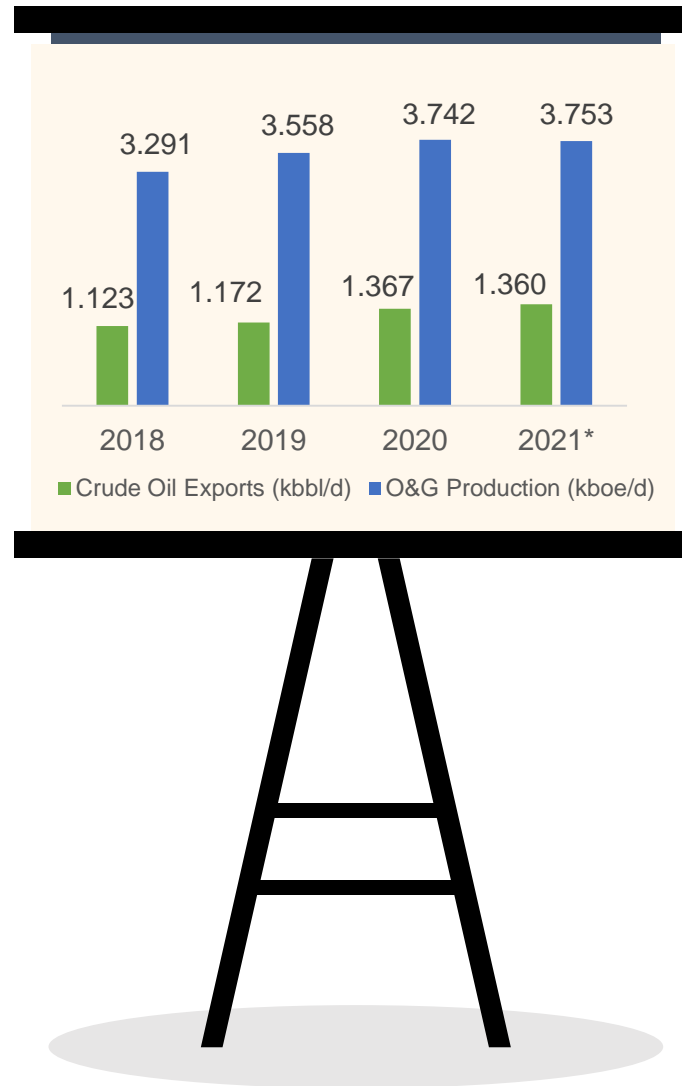
### Assets Acquisition

50 M&As approved by ANP



COVID 19

Flexible emergency measures - supportive approach by ANP



## 2021



### Maintenance of O&G production and crude oil exports

\*Jan-July results as shown in the graph



### 2 or 3 Bidding Rounds

In the 2<sup>nd</sup> semester (total of 1,162 areas available, considering the Open Acreage)



### Assets Acquisition increased

~50 M&As approved by ANP only up to July 2021



COVID 19

Returning to business-as-usual, but continued flexibility available where required

#1

**E&P**

# Brazil is taking a leading role in the E&P sector



## 2021



**8<sup>th</sup>**

Crude Oil and  
Condensate  
producer  
(BP Statistical  
Review 2021)



**87**

E&P company  
groups, 50% foreign  
(August 2021)

### Production:

**3M**

Bpd of oil  
production  
(August 2021)

**137M**

M<sup>3</sup> of gas  
production  
(August 2021)

### Reserves:

**12B**

Bbl in proved oil  
reserves  
(Dec 2020)

**337B**

M<sup>3</sup> in proved gas  
reserves  
(Dec 2020)

## Forecast

Potential to reach  
more than



**5**

million oil bpd in  
2030 (EPE)

Potential to be the



**5<sup>th</sup>**

Largest crude oil  
exporter in 2030  
(EPE)

# E&P at a glance



## Pre-Salt

One of the best plays in the world and the most competitive deepwater assets.

**72%** of production  
**131** producer wells  
**21,104** Average well production (boe/d)

Prod: **2,764,684** boe/d

## Post-Salt

Green and brownfields, deep and shallow waters.

**22%** of production  
**355** producer wells  
**2,397** Average well production (boe/d)

Prod: **850,775** boe/d

## Onshore

Mature basins and new frontier basins (gas prone).

**6%** of production  
**5,806** producer wells  
**41** Average well production (boe/d)

Prod: **240,824** boe/d

\*August, 2021

**26<sub>B</sub>**

Barrels equivalent of O&G produced to date

**375**

Fields under development or production

**249**

Exploratory Blocks

**400+**

Production Installations

**50**

Billion dollars E&P Investments Forecast 2021 – 2025

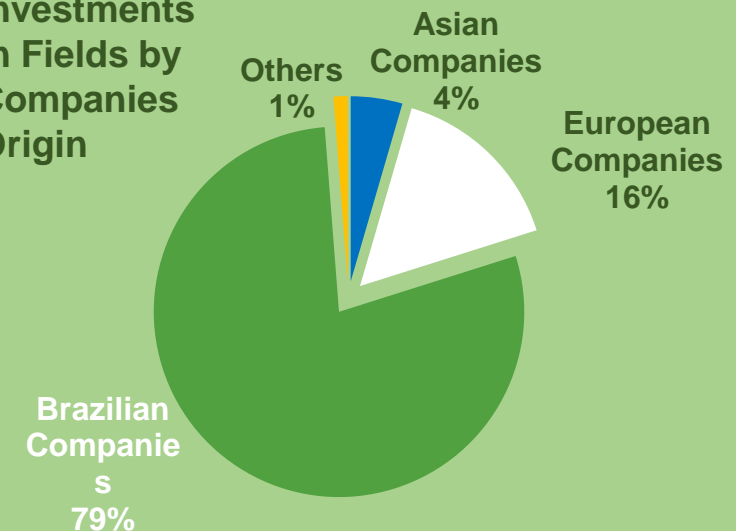
**5**

Billion dollars Decommissioning Costs 2021-2025

**30,000+**  
Wells drilled

**19,000+**  
Km of O&G pipelines

Investments in Fields by Companies Origin



# E&P strategic goals



## RIGHT ASSETS IN THE RIGHT HANDS

Petrobras Divestment Plan plays key role in this goal. Support small and medium producers market



## INCREASE THE RECOVERY FACTOR

Brazil's Current RF: 10% This represents an enormous opportunity in the **mature fields**. Need to reduce OPEX and decommissioning costs



## INCREASE EXPLORATORY ACTIVITIES

The COVID-19 pandemic accelerated **energy transition** discussions and reinforced the **sense of urgency** in exploring our resources



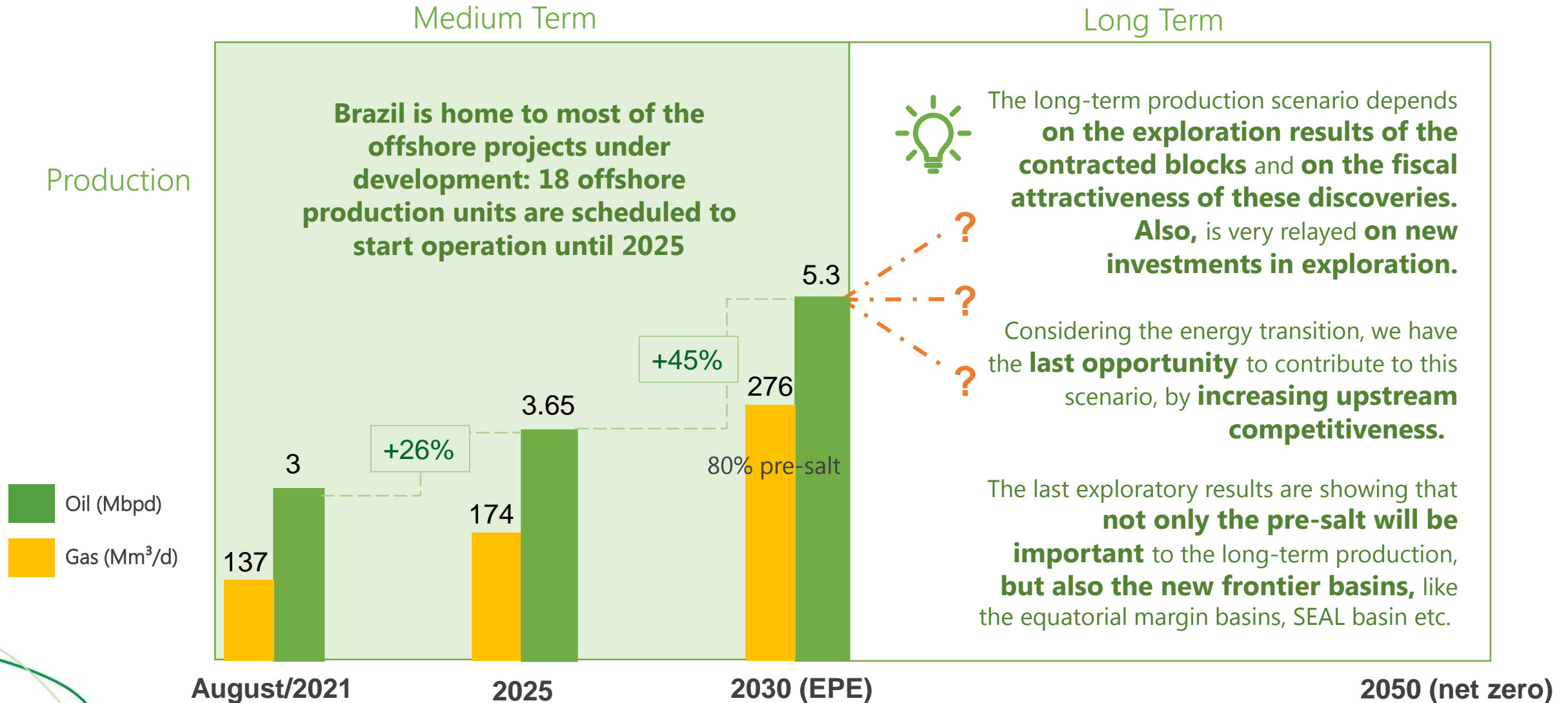
## MAKE VIABLE THE MARGINAL DISCOVERIES

There are many **marginal discoveries** in the **different environments** that could be developed if we address the correct incentives to make them viable

We need to keep increasing **above ground competitiveness** in order to achieve our main goals



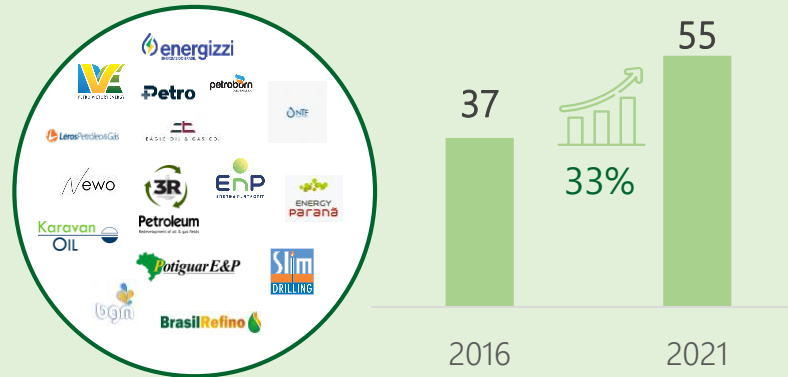
# Brazil is poised to be one of the key sources of growth over the medium term, but still need to keep taking measures for the long term



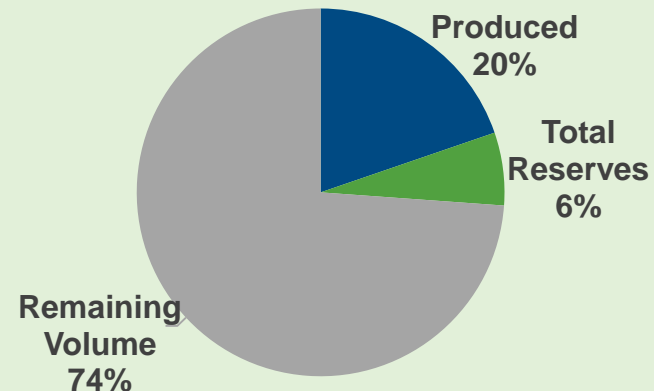
# A new onshore market is being set up

A new onshore market with small and medium companies is being established with Petrobras Divestment Plan, supported by foreign and national investors

## Onshore E&P Groups in Brazil



## Recovery Factor in Brazil



## Key Messages

All onshore fields are being sold by Petrobras

The numbers of E&P groups acting in onshore activities increased more than **30%** since 2016

New operators are increasing production by more than **30%**

Huge investment opportunities in mature fields (IOR/EOR). 1% more in the onshore RF means **200Mboe**

# Ongoing measures to attract investments



## KEEP OFFERING AREAS

17<sup>th</sup> Bidding Round  
2<sup>nd</sup> ToR Surplus  
Open Acreage  
+  
Ongoing Petrobras  
Divestment Plan



## ONSHORE DATA AVAILABLE FOR FREE

Download:  
[Reate.cprm.gov.br/anp](http://Reate.cprm.gov.br/anp)  
Studies in progress also to make public offshore data



## MARGINAL FIELD DEFINITION

Draft in preparation.  
Expected public consultation in the second semester of 2021. Specific incentives should be discussed afterwards



## ROYALTIES REDUCTION FOR SMALL AND MEDIUM COMPANIES

New ANP Resolution to be approved in the second half of 2021

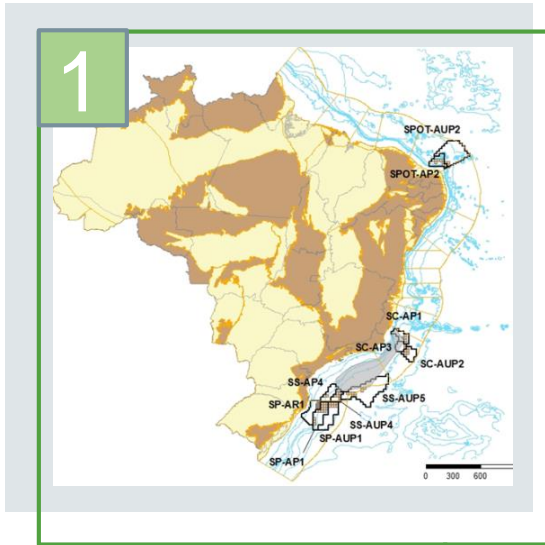


## OTHER REGULATORY MEASURES TO REDUCE ABOVE GROUND RISKS AND IMPROVE FISCAL TERMS

Measures under REATE, PROMAR and BIDSIM programs, including studies to improve environmental licensing process and competitiveness of marginal discoveries

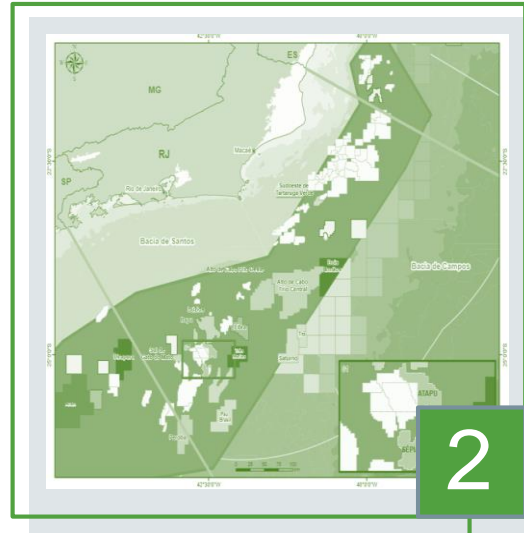
Already implemented:  
contract extension, royalties reduction for incremental production

# Brazil has great opportunities in 2021 auctions



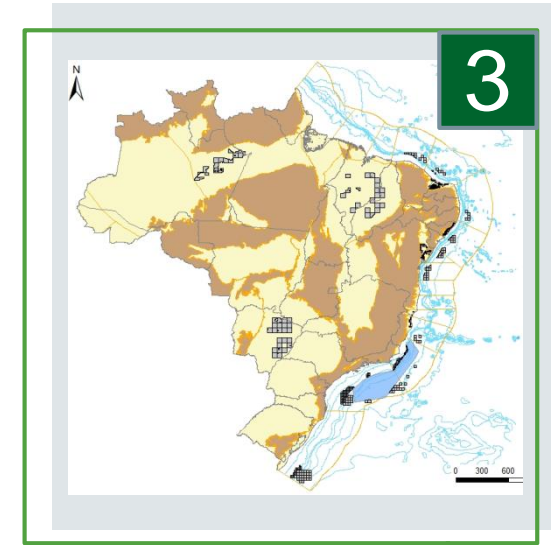
92 blocks on offer  
Campos, Pelotas, Potiguar and Santos Basins  
Pre-salt opportunities beyond 200 nautical miles with 3D seismic recently acquired  
October 7<sup>th</sup>

**ROUND**  
Brazil **17**  
OIL AND GAS CONCESSIONS



2 pre-salt fields: **Atapu and Sépia**  
~12 Billion bbl (OOIP)  
Technical and Economical Parameters approved by CNPE  
December 17<sup>th</sup>

TRANSFER OF  
RIGHTS SURPLUS  
Brazil  
PRODUCTION SHARE



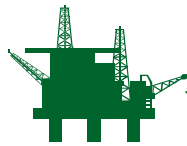
1,068 blocks available.  
Additional 350 blocks and 11 marginal fields under study to be added in the future.  
The 3rd cycle depends on the interest declaration

OPEN  
ACREAGE  
Brazil  
OIL AND GAS CONCESSIONS

# Natural gas: a big opportunity in the energy transition environment

Towards an open and competitive natural gas market

## Offshore gas potential



Huge gas potential in the pre-salt.

All efforts are being made so that this gas can be monetized

## Onshore gas potential



4 paleozoic basins with potential for natural gas: Parnaíba, Solimões, Amazonas, Paraná basins

Most of the onshore exploration in new frontier basins is to produce gas. Relevant reservoir-to-wire projects implemented

## New gas market



The new Gas Law (Law 14,134 / 2021) is a decisive step towards an open, liquid and competitive market

A robust regulatory agenda is underway to build the new natural gas market, which is creating big opportunities in Brazil

#2

# Energy Transition

# Brazil has one of the cleanest energy mix in the world

Brazil is well-positioned in the energy transition. Almost half of the primary energy sources are renewables and about 85% of the electricity generation come from renewable sources. Brazil was announced as a global champion for the UN High-level Dialogue on Energy, taking a leading position in the energy transition theme.

## Renewable energy sources in the Brazilian Energy Mix

48.4%



Sugarcane Biomass (19.1%)

Hydro (12.6%)

Firewood and charcoal (8.9%)

Others (7.7%)

**Brazil  
(2020)**

13.8%



**World Average**



## Electricity generation from renewable sources in 2020

84.8%

Solar  
Wind  
Biomass

1,70%  
8,80%  
9,10%

Hydro  
65,20%

23%

**World Average**

# Emissions in the energy sector represent less than half of world average

01

Brazil is not ranked in the top emitters in the energy sector.

## Top Emitters in Energy Sector (All GHG)

2018	CO <sub>2</sub> e
● Others	12.57Gt
● China	10.32Gt
● United States	5.27Gt
● India	2.42Gt
● Russia	2.28Gt
● Japan	1.09Gt
● Iran	716.76Mt
● Germany	713.82Mt
● Canada	626.07Mt
● South Korea	617.23Mt
● Indonesia	598.17Mt

...  
**Brazil (437,33 Mt)**

Source: Climate Watch (CAIT)

02

Energy makes up nearly three-quarters of global emissions, but in Brazil it represents around 30% of the total emissions.

## Emissions by Sector – World (All GHG)

2018

● Energy	76%
● Agriculture	12%
● Industrial Processes	5.9%
● Waste	3.3%
● Land-Use Change and Forestry	2.8%

## Emissions by Sector – Brazil (All GHG)

2018

● Agriculture	35%
● Energy	31%
● Land-Use Change and Forestry	27%
● Waste	4.9%
● Industrial Processes	2.0%

02

Regarding fossil fuel and cement emissions, Brazil answers for 1.3% of global emissions

## Top Fossil Fuel and Cement Emitters (CO<sub>2</sub>)

2019

● Others	34%
● China	28%
● United States	15%
● India	7.2%
● Russia	4.6%
● Japan	3.0%
● Iran	2.1%
● Germany	1.9%
● Indonesia	1.7%
● South Korea	1.7%
● Saudi Arabia	1.6%

...  
**Brazil (1,3%)**

Source: Climate Watch (GCP)

CO<sub>2</sub> emissions per capita: on average, each Brazilian emits 1/7 of what an American emits and 1/3 of what a citizen of the European Union or a Chinese emits in the production and consumption of energy



## Emissions goals announced by the government



NDC\* target of 37% reduction in GHG emissions by 2025 and **43% reduction in GHG emissions by 2030**, compared to 2005 levels.

*\*National Determined Contribution - NDC*



*On the pathway to net zero emissions, oil and gas will continue to play an important role. Due to the quality of our assets, we believe we can maintain our position as a competitive O&G producer, with low carbon emissions.*

# Energy Transition: Highlights in the upstream

01

Since 2009, O&G production operated by Petrobras (who operates more than 90% of the O&G production in Brazil) increased more than 40% without increasing emissions. Also, Petrobras established several ESG commitments in the E&P like **zero routine flaring by 2030, 32% reduction in carbon intensity and 30-50% reduction in methane emissions by 2025**. Brazil has already a high produced gas utilization rate (more than 97%).

## 10 Sustainability Commitments



CLIMATE



WATER



WASTE



BIODIVERSITY



SOCIAL RESPONSIBILITY

1. Zero growth in absolute operating emissions until 2025
2. Zero routine flaring by 2030
3. ~40 MM ton CO<sub>2</sub> reinjection in CCUS (*Carbon Capture, Utilization and Storage*) projects
4. 32% reduction in carbon intensity in the E&P segment by 2025, reaching 15 kgCO<sub>2</sub>e/boe
5. 30%-50% reduction in methane emission intensity in the E&P segment by 2025
6. 16% reduction in carbon intensity in the refining segment by 2025, reaching 36 kgCO<sub>2</sub>e/CWT
7. 30% reduction in freshwater capture in our operations with focus on increasing reuse by 2025
8. Zero increase in waste generation by 2025
9. 100% of Petrobras facilities with a biodiversity action plan by 2025
10. Investments in environmental and social projects

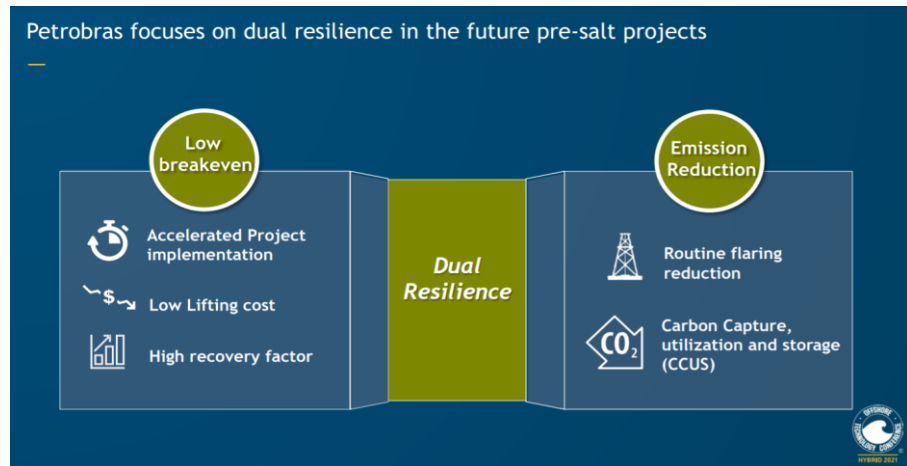
\*Note: Carbon commitments related to 2015 base. Other commitments based on 2018.

Source: Petrobras (ESG Presentation, Oct 2020)

02

**Pre-Salt: globally competitive assets in the energy transition scenario, with low breakeven and low GHG emissions**

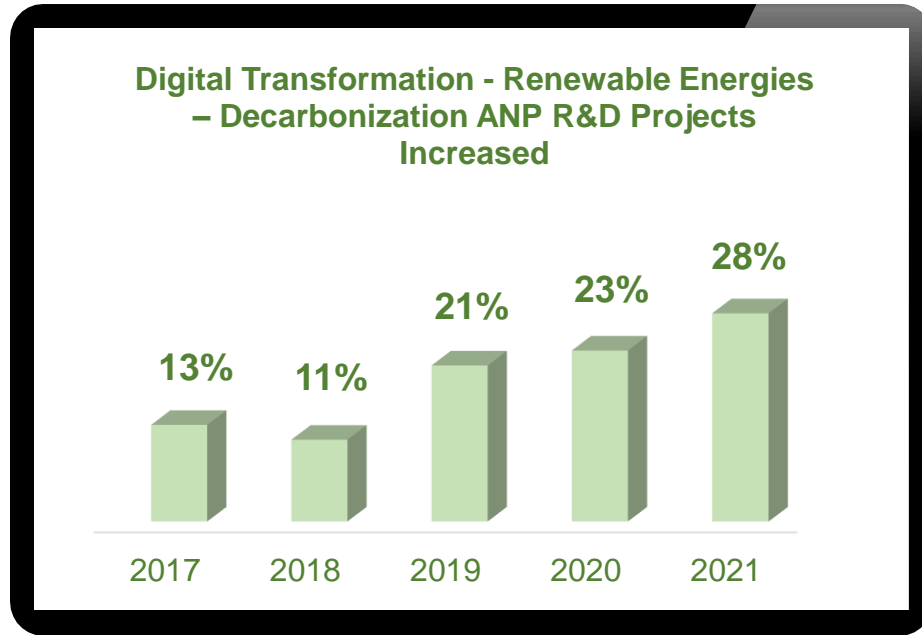
Bacalhau oil discovery, to be operated by Equinor, is expected to produce about 9 kg of carbon dioxide (CO<sub>2</sub>) per barrel, against a global average of 17 kg per barrel. Exxon, one of the partners, announced this project will have 65% lower GHG emissions in 2025 than the upstream division average.



Source: Petrobras; Reuters; Energy Intelligence

# Technology: Operators in the upstream are seeking to increase efficiency, reduce costs and decrease carbon footprint

The graphs present the results of the R&D resources that must be applied in Brazil



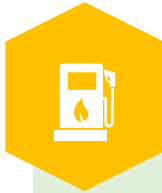
Over the past five years, oil companies have been increasing the proportion of R&D projects related to **Digital Transformation, Renewable Energy and Decarbonization** compared to all contracted projects per year. This represents an investment over than U\$ 230 million for these technologies in the period.

## Word Cloud – Keywords

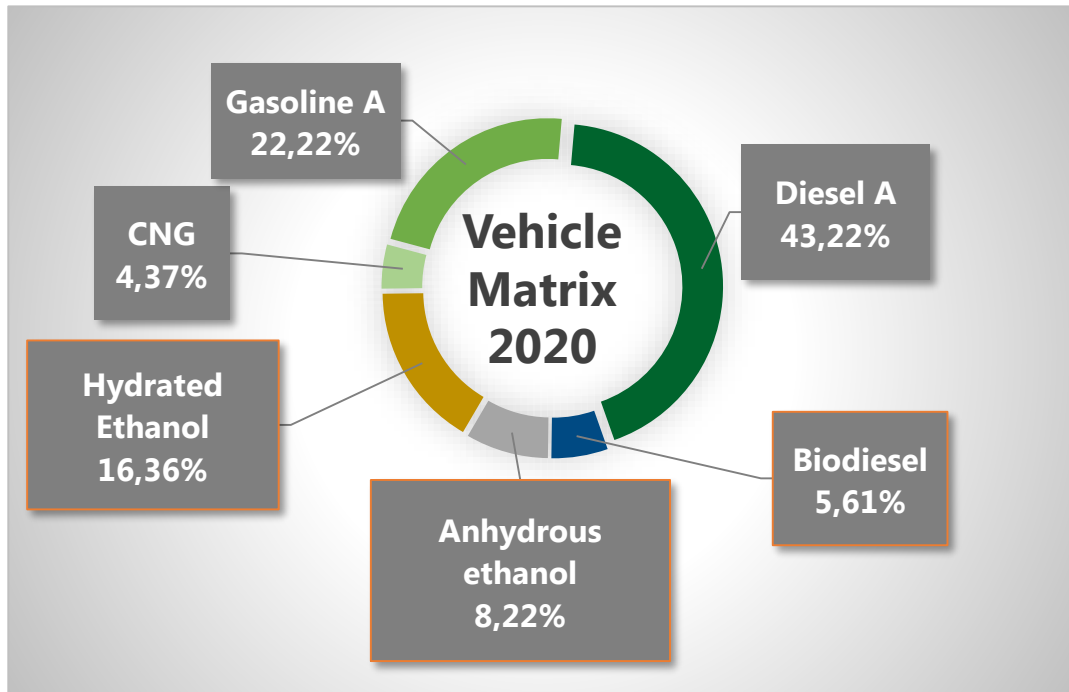


In the last 3 years, **artificial intelligence, machine learning, smart completion** and **CO2 capture** have been the most frequent keywords in new R&D projects approved by ANP, confirming the growing interest of oil companies in increasing efficiency, reduce costs and decrease carbon footprint. Digital Transformation and decarbonization are pillars for the O&G Industry sustainability in the long-term

# Energy Transition: Highlights in the downstream



Brazil is the 2<sup>nd</sup> largest producer and consumer of biofuels. 30% of the vehicle matrix is fueled by renewables and 70% to 80% of our automobiles are flex-fuel



## Main Government Programs



**Renovabio:** in 2020, more than 14 million tons of greenhouse gas emissions were avoided.



**Fuel of the Future:** incentives to the large-scale use of 2<sup>nd</sup> generation ethanol; R&D to encourage fuel-cell technology; creation of green corridors to supply heavy vehicles powered by biomethane; introduction of BioJetFuel; BioCCS etc



**Refineries:** investments on increase energy efficiency, reduce emissions, increase water reuse and generate lower sulfur products or products with renewable content

# Brazil has huge and diverse potential for renewables

Brazil is currently among the five most attractive emerging markets for investments in renewable energy. (<https://global-climatescope.org/>)

Oil majors are also betting on the Brazilian renewables market. We believe they will integrate their portfolio with cleaner energy projects, while capitalizing on synergies and tapping the huge potential in Brazil for renewable energy projects.



## Biofuels

Brazil has large experience in producing biofuels and benefits from a longstanding well-established industry. Shell (Raízen) and BP (BP Bunge Bioenergia) are betting high in this market.



## Biogas/ Biomethane

Biogas has every condition to achieve greater participation in the Brazilian energy matrix. The sugarcane industry represents a large opportunity for biogas generation. One example is the Raízen Geo Biogas plant.



## Hydrogen

National Hydrogen Program was established recently. Possible investments in green hydrogen announced so far in Ceará, Pernambuco and RJ States are only from companies in the renewable energy sectors.



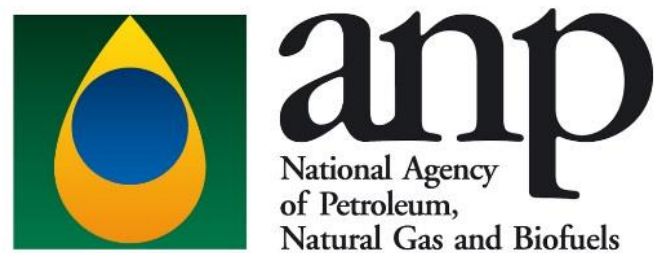
## Solar

Solar and Wind energies represent a good proportion of our energy matrix. Total operates three solar plants and is developing new wind projects through its affiliate Total Eren. Also, the first solar plant in Equinor's global portfolio is located at Ceará State (Apodi solar power plant).



## Wind

Brazil enjoys great potential for offshore wind plants. Brazil's shallow waters alone hold potential for 700GW of offshore wind generation. Equinor plans to install 4GW of offshore wind energy in Rio and Espírito Santo States.



<http://rodadas.anp.gov.br/pt/>

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Av. Rio Branco 65, 21<sup>st</sup> floor - Rio de Janeiro – Brazil  
Phone: +55 21 2112-8100