AAPG Latin America & Caribbean Region | BRAZIL 2023 Geosciences Technology Workshop

Co-hosted by ABGP Associação Brasileira de Geólogos do Petróleo

BAZILIAN SCENARIO

The Importance of Exploration and Production in the Energy Transition

Ronan Ávila
Deputy Superintendent, Geological and Economic Assessment Superintendency **[ANP-SAG]**
Tuesday, 9 May 2023

anp

NOTICE

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Agenda

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Brazil´s Energy Mix

World Consumption and Fossil Fuel Demands

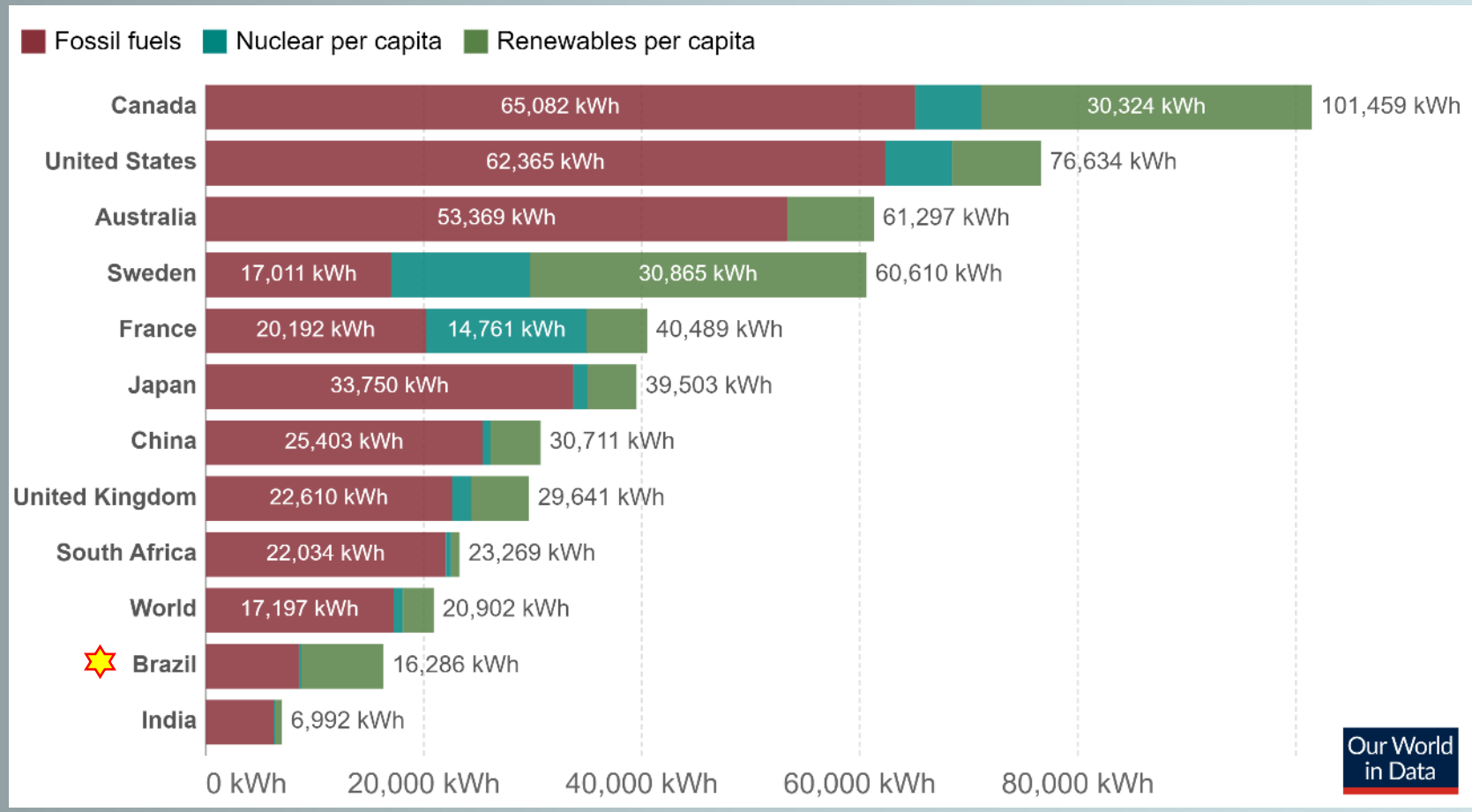
GHG (Focused on CO_2)

Brazil E&P Overview

The Importance of E&P in the Energy Transition

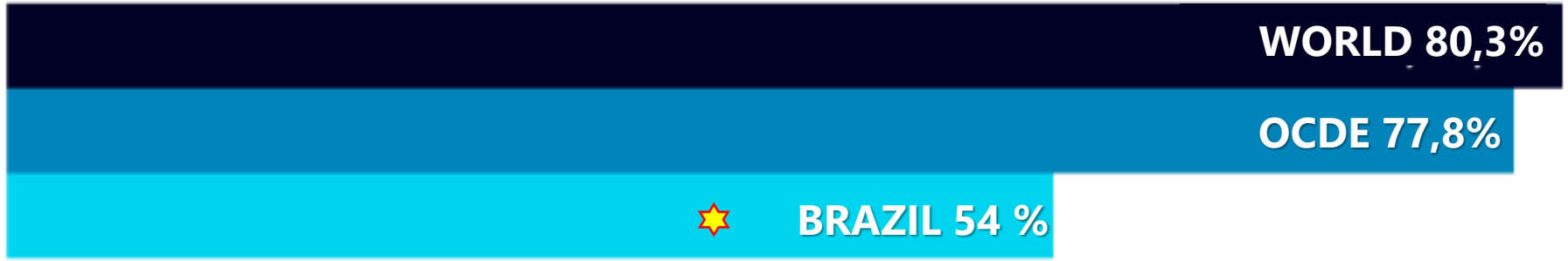
Final Remarks

Per capita energy from fossil fuels, nuclear and renewables, 2021



Percentage of Fossils in the Brazilian Energy Mix

% OF FOSSIL IN THE **ENERGY** MIX



EPE 2022; Resenha Energética Brasileira 2022, ano base 2021, pg. 24,
https://www.gov.br/mme/pt-br/assuntos/secretarias/spe/publicacoes/resenha-energetica-brasileira/resenhas/resenha-energetica-2022.pdf/view

"World Fossil fuels accounted for 82% of primary energy use last year, down from 83% in 2019 and 85% five years ago."

BP 2023; Statistical Review of World Energy, Energy developments 2021,
Statistical Review of World Energy | Energy economics | Home (bp.com)

Percentage of Fossils in the Brazilian Electric Mix

% OF FOSSIL IN THE **ELETRIC**[*1] MIX

*[1] The electrical is part of the energy mix

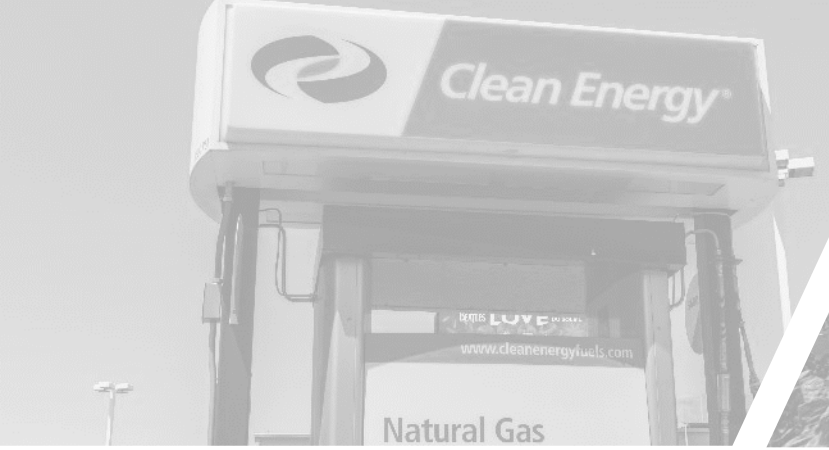
BRAZIL	OCDE	WORLD
19,7 %	52,7%	62,7%

EPE 2022; Resenha Energética Brasileira 2022, ano base 2021, pg. 25,
https://www.gov.br/mme/pt-br/assuntos/secretarias/spe/publicacoes/resenha-energetica-brasileira/resenhas/resenha-energetica-2022.pdf/view

Percentage of Bioenergy in the Brazilian Transport

% OF BIOENERGIES IN TRANSPORT

EPE 2022; Resenha Energética Brasileira 2022, ano base 2021, pg. 30,
https://www.gov.br/mme/pt-br/assuntos/secretarias/spe/publicacoes/resenha-energetica-brasileira/resenhas/resenha-energetica-2022.pdf/view



Currently, Brazil's energy mix is undoubtedly one of the cleanest on a global scale.

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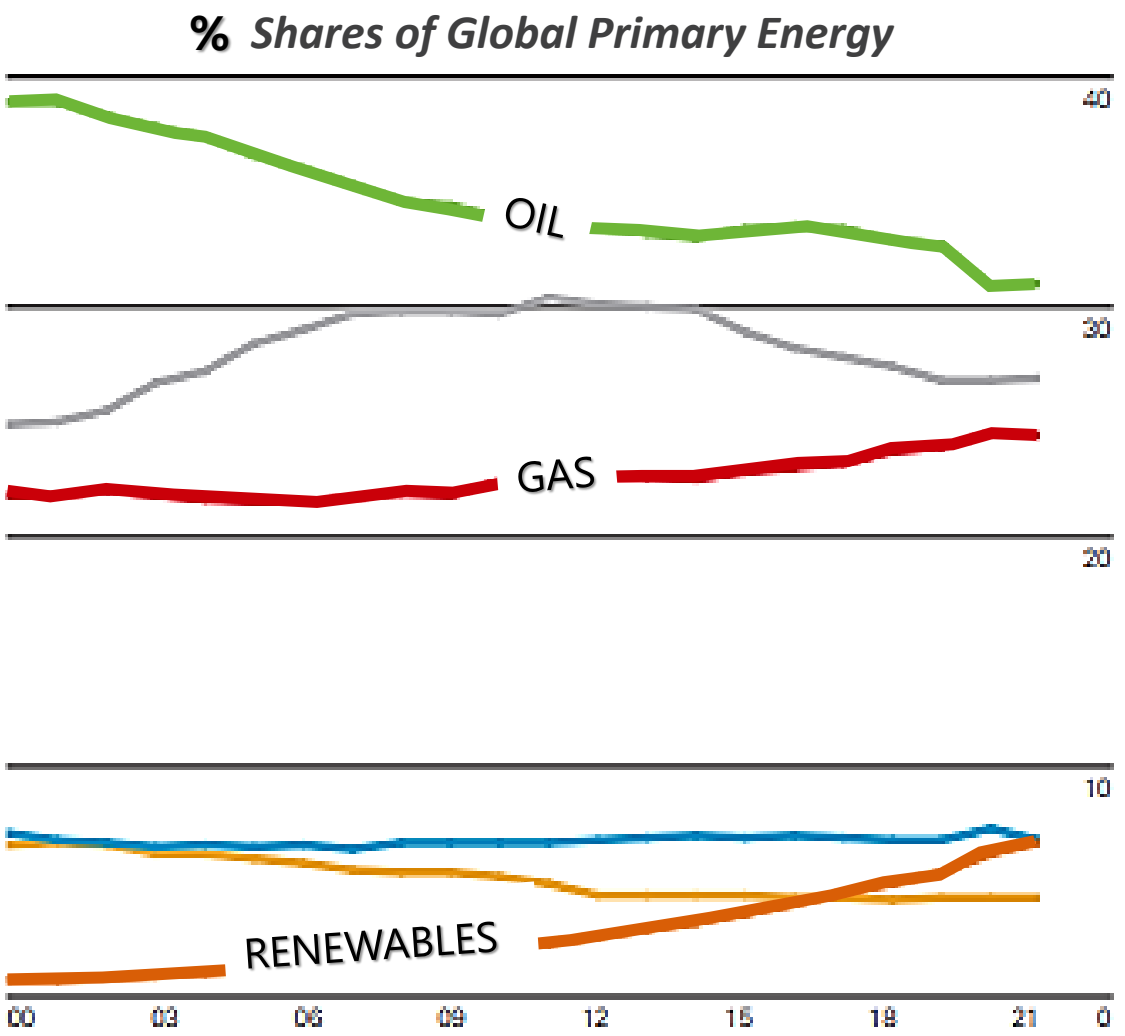
World **Consumption** – 2021

Shares of Global Primary Energy

%

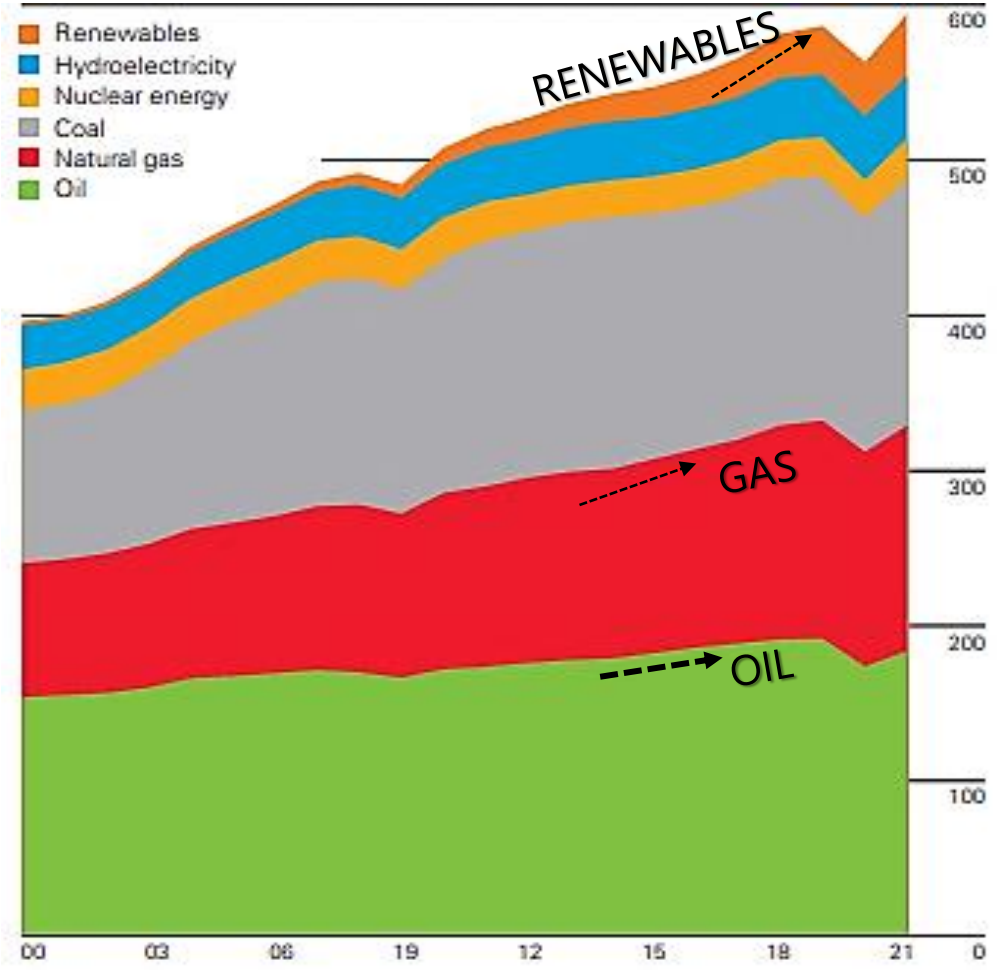
- OIL
- COAL
- GAS
- HYDROELETRICITY
- NUCLEAR ENERGY
- RENEWABLES



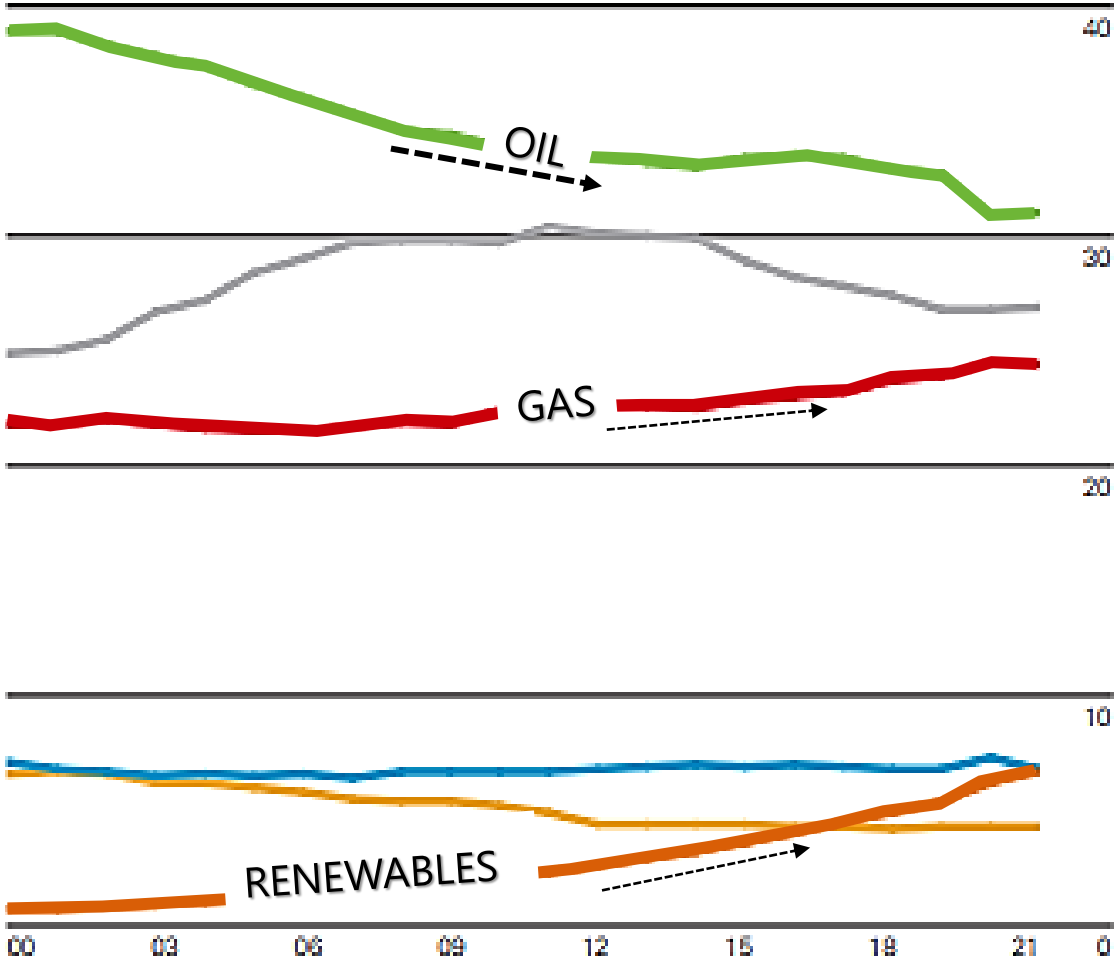
2023BP Statistical Review of World Energy 2022, 71st Editions, pg. 12; Statistical Review of World Energy 2022 (bp.com) - edited

World **Consumption** – 2021

World Consumption *(Exajoules)*

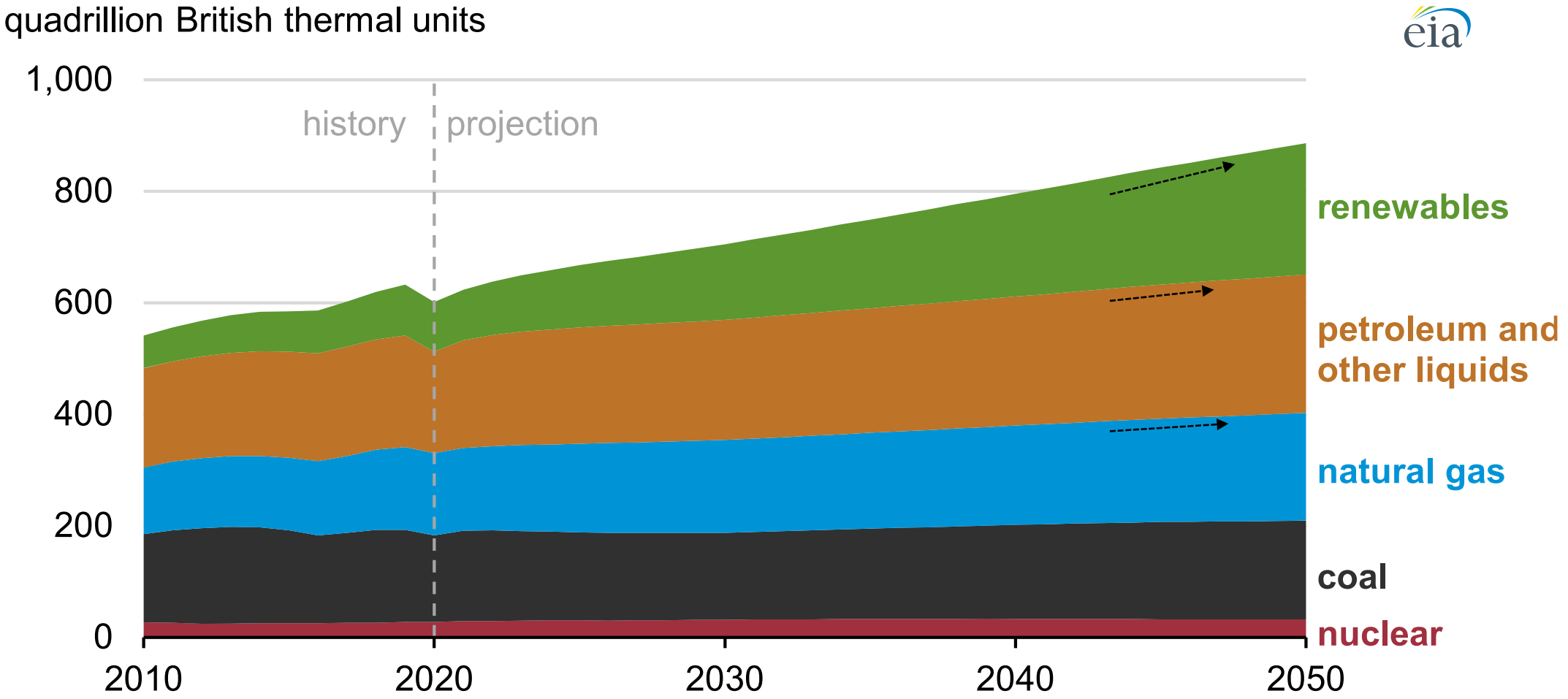


% Shares of Global Primary Energy



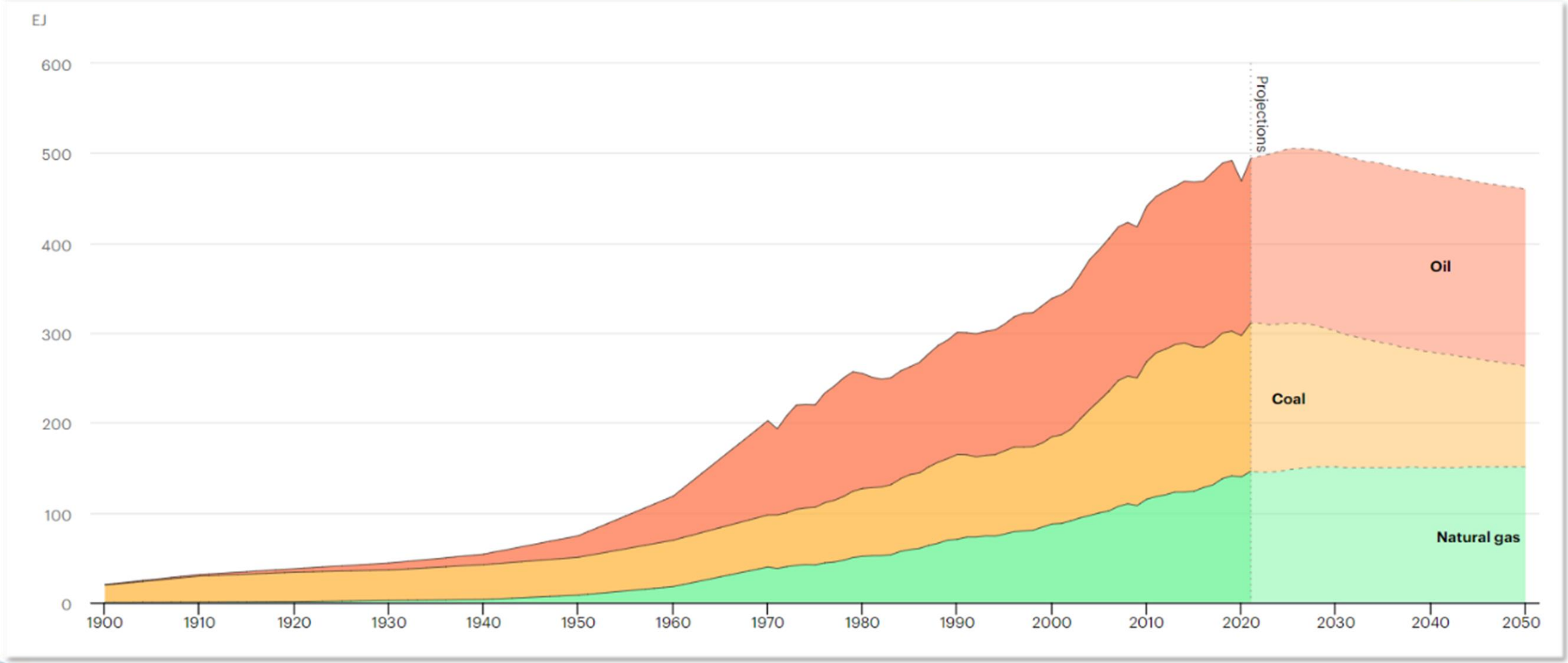
2023BP Statistical Review of World Energy 2022, 71st Editions, pg. 12; Statistical Review of World Energy 2022 (bp.com) - edited

Global primary energy **consumption** by energy source, 2010-**2050**



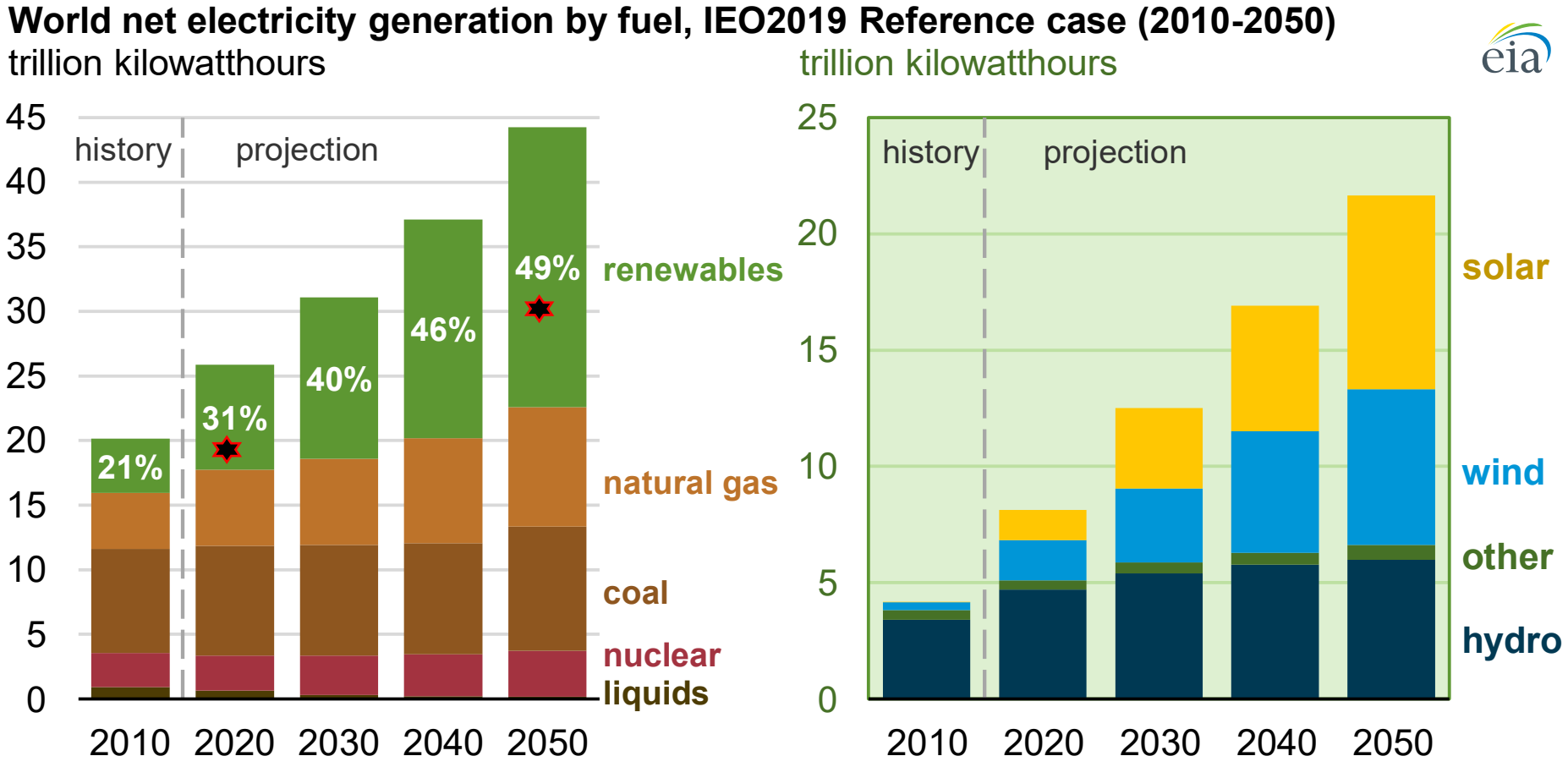
U.S. Energy Information Administration, *International Energy Outlook 2021* Reference case
Note: *Petroleum and other liquids* includes biofuels https://www.eia.gov/todayinenergy/detail.php?id=49876

World Fossil Fuel **Demand** in the Stated Policies Scenario, 1900-**2050**



IEA 2023; World Energy Outlook 2022, https://www.iea.org/reports/world-energy-outlook-2022/executive-summary, IEA. Licence: CC BY 4.0

World net electricity generation by fuel, 1900-**2050**



U.S. Energy Information Administration, *International Energy Outlook 2019*
https://www.eia.gov/todayinenergy/detail.php?id=42555

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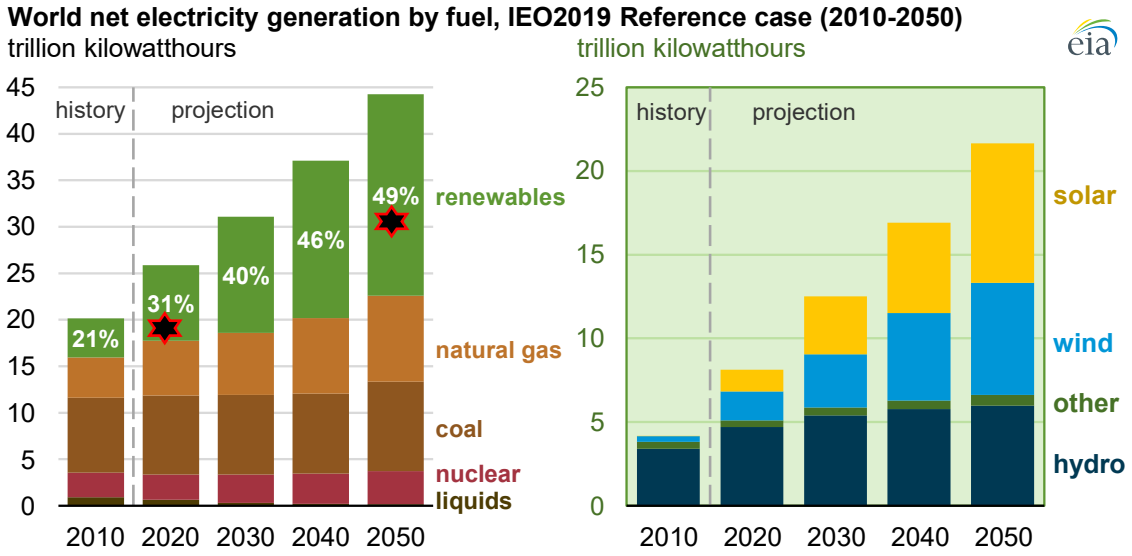


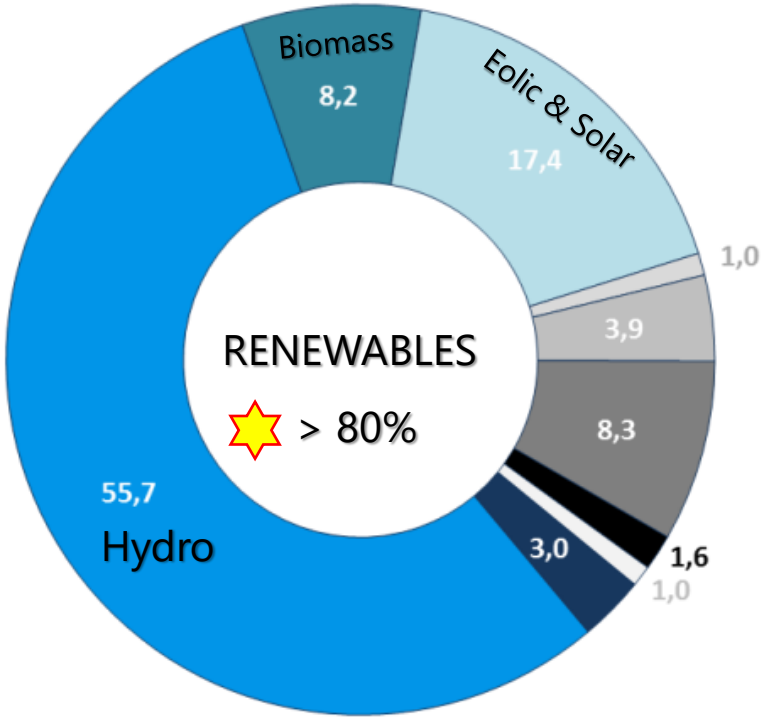
U.S. Energy Information Administration, *International Energy Outlook 2019*
https://www.eia.gov/todayinenergy/detail.php?id=42555

Actual % of fossil in the eletric mix, **2021-2022**

BRAZIL	OCDE	WORLD
19,7 %	52,7%	62,7%

EPE 2022; Resenha Energética Brasileira 2022, ano base 2021, pg. 25

Brazil - **%** Offer of **Electricity** Generation Power **2021**



EPE 2022; Resenha Energética Brasileira 2022, ano base 2021, pg. 35

- **Currently, Brazil's numbers for clean energy are better than the global average it aims to achieve by 2050; and we are committed to continuing this trajectory towards a cleaner future;**
- **Fossil fuels will remain important in the energy mix worldwide, even during the transition to alternative sources.**

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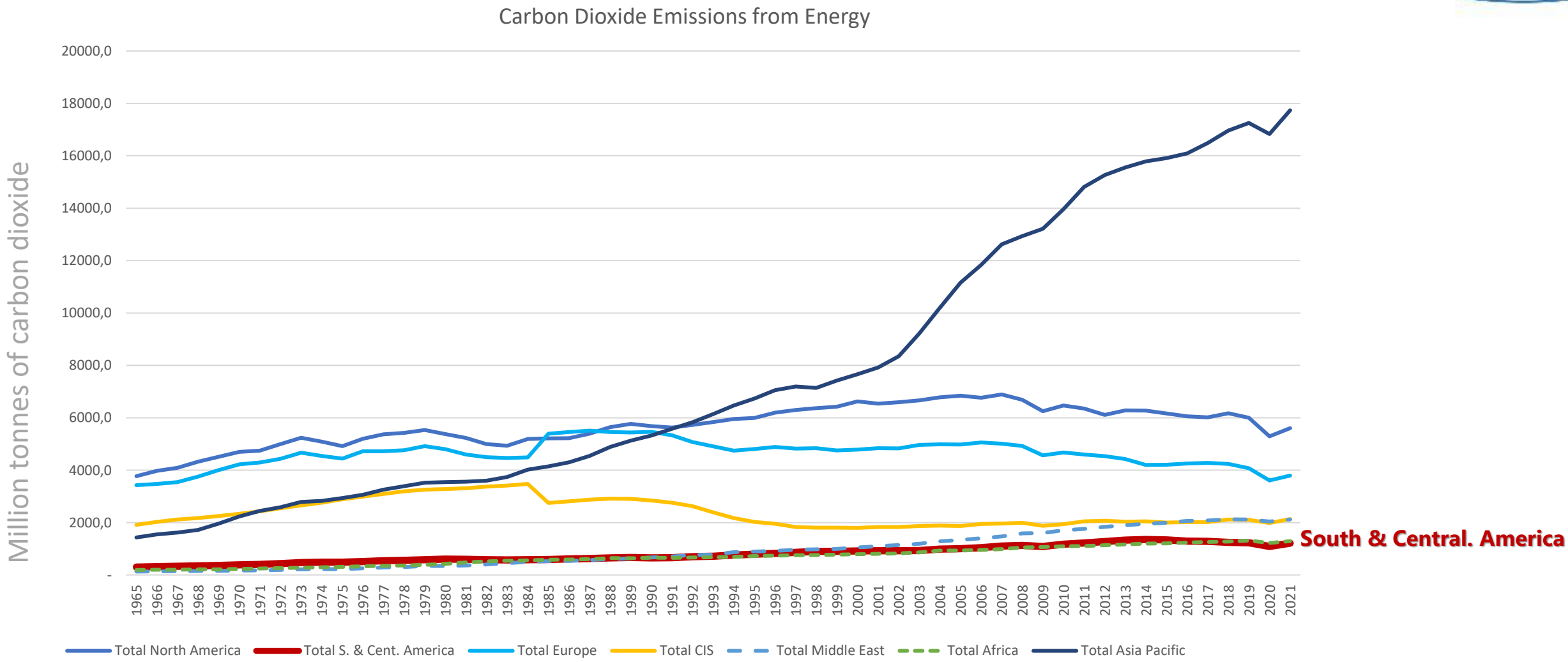
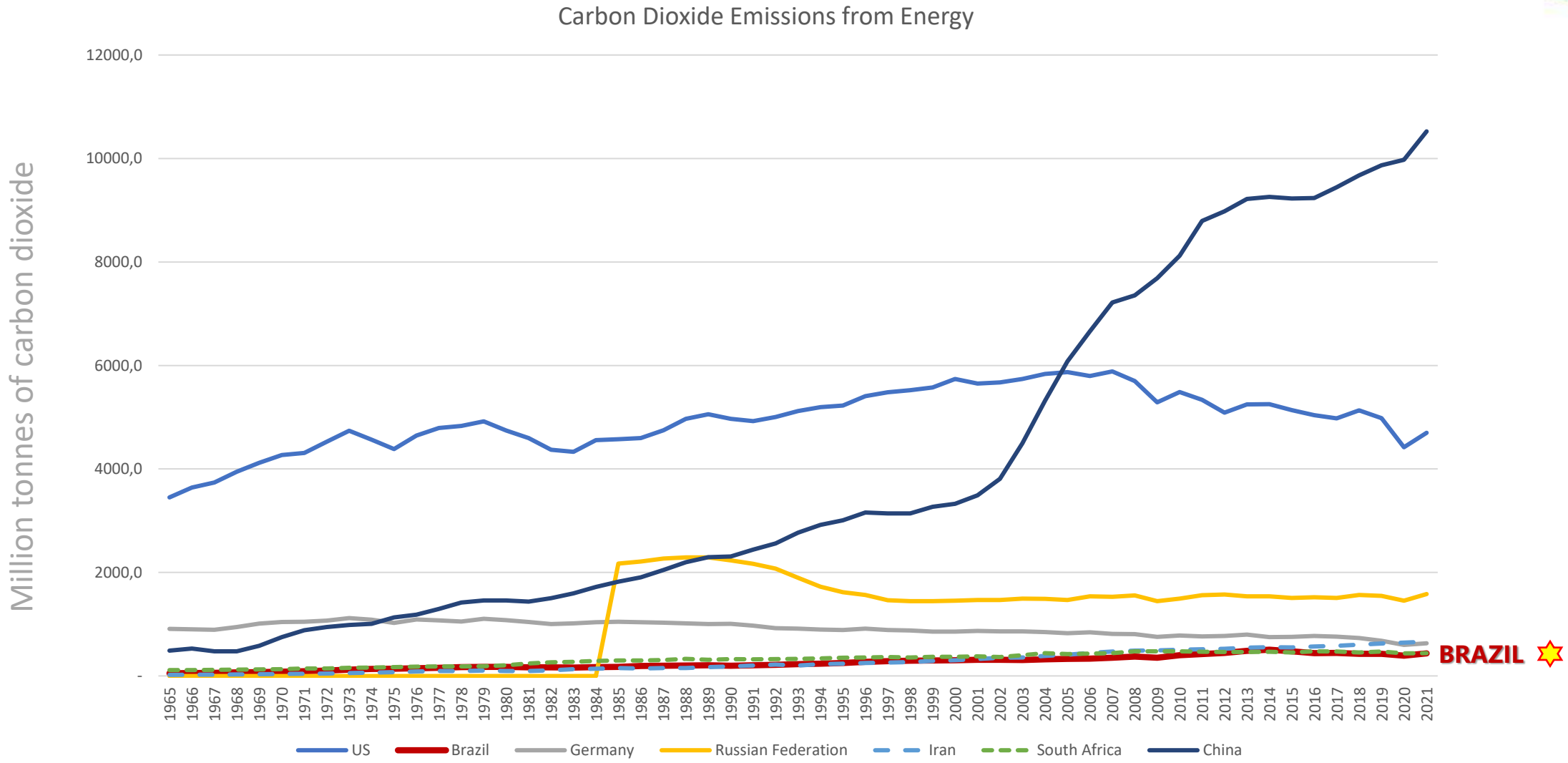
Carbon Dioxide Emissions from Energy by Region



BP 2023; Statistical Review of World Energy, CO_2 emissions, BP p.l.c. Copyright © 1996-2023; graph built from
https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2022-all-data.xlsx

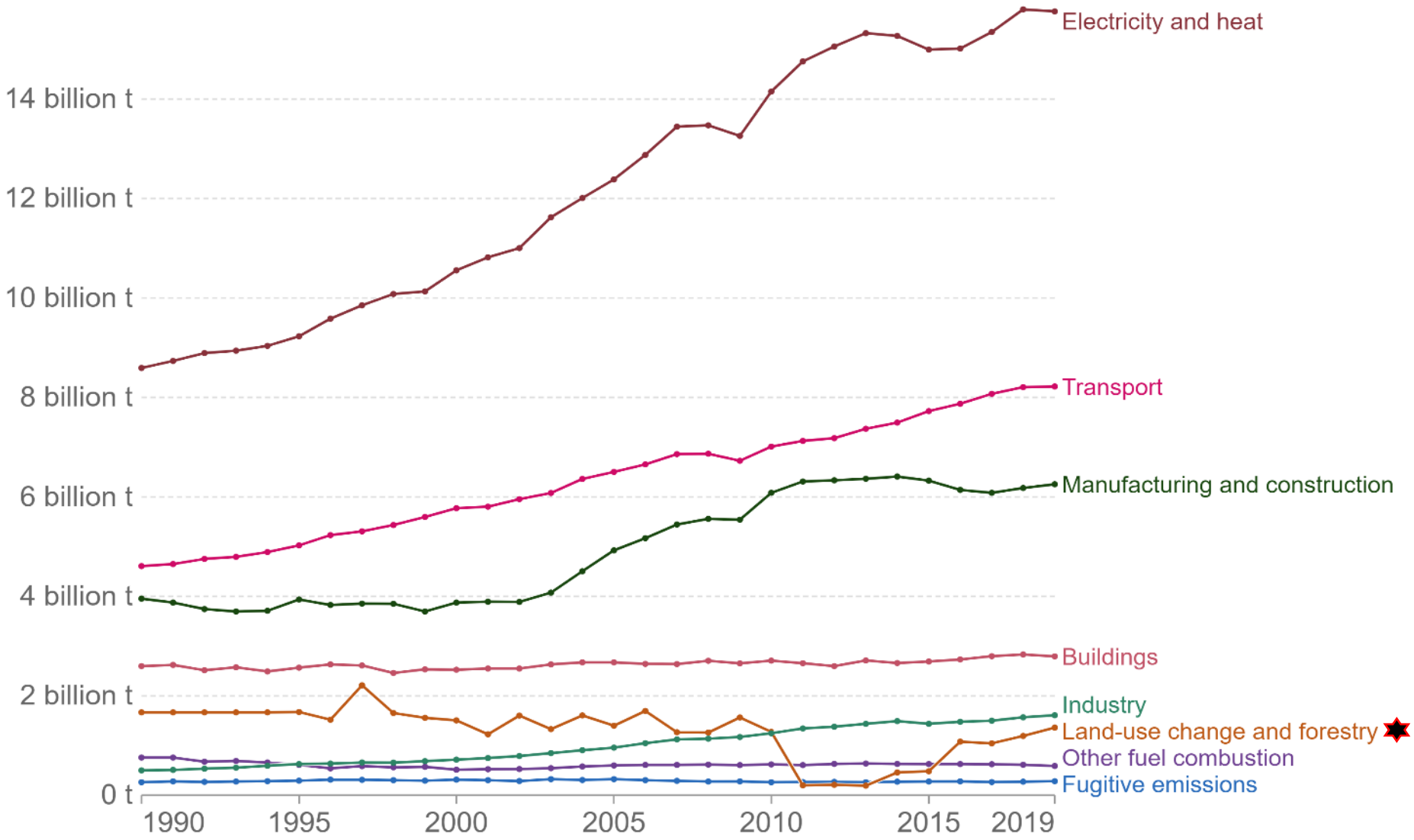
Carbon Dioxide Emissions from Energy by Country (Top Country of the Region)



BP 2023; Statistical Review of World Energy, CO_2 emissions, BP p.l.c. Copyright © 1996-2023; graph built from

https://www.bp.com/content/dam/bp/business-sites/en/global/corporate/xlsx/energy-economics/statistical-review/bp-stats-review-2022-all-data.xlsx

CO_2 emissions by sector, World



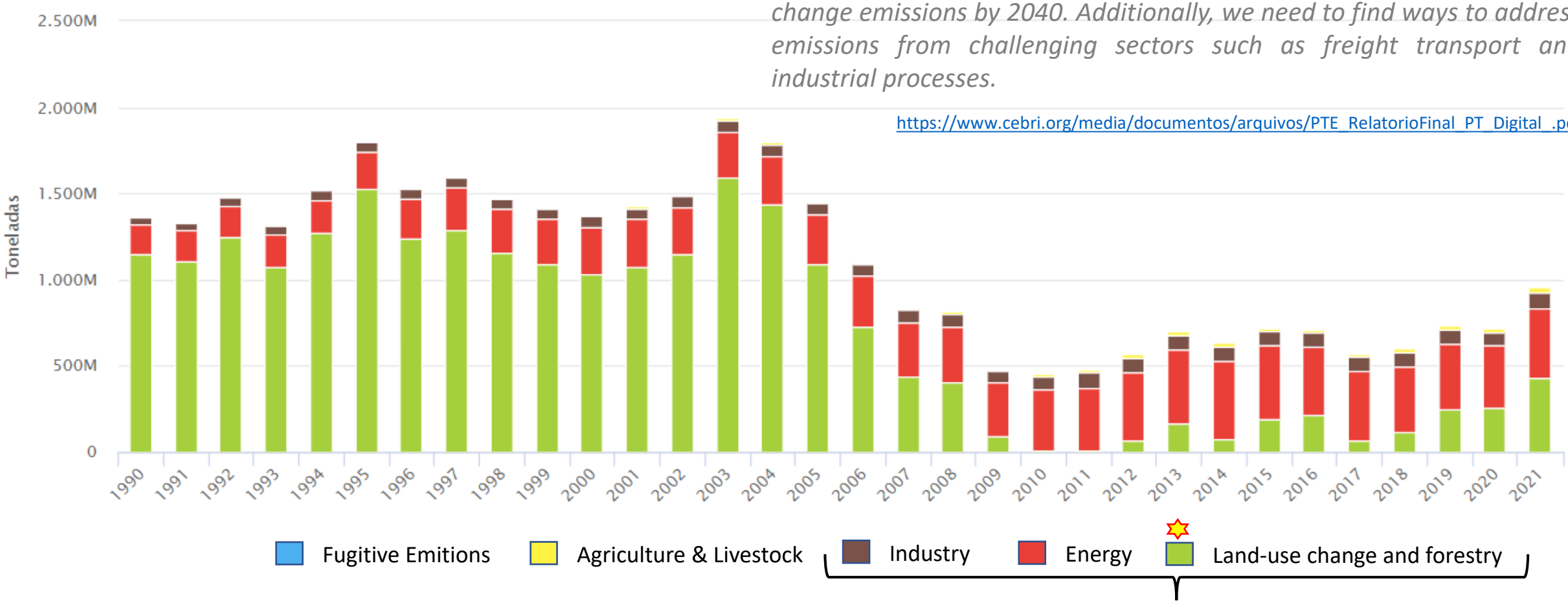
Source: Our World in Data based on Climate Analysis Indicators Tool (CAIT). OurWorldInData.org/co2-and-greenhouse-gas-emissions • CC BY

Brazil CO_2 Liquid Emissions by Sector, 1990-2022

CO_2

In order to avoid costly consequences for the energy transition and competitiveness, it is crucial to address deforestation and land use change emissions by 2040. Additionally, we need to find ways to address emissions from challenging sectors such as freight transport and industrial processes.

https://www.cebri.org/media/documentos/arquivos/PTE_RelatorioFinal_PT_Digital_.pdf



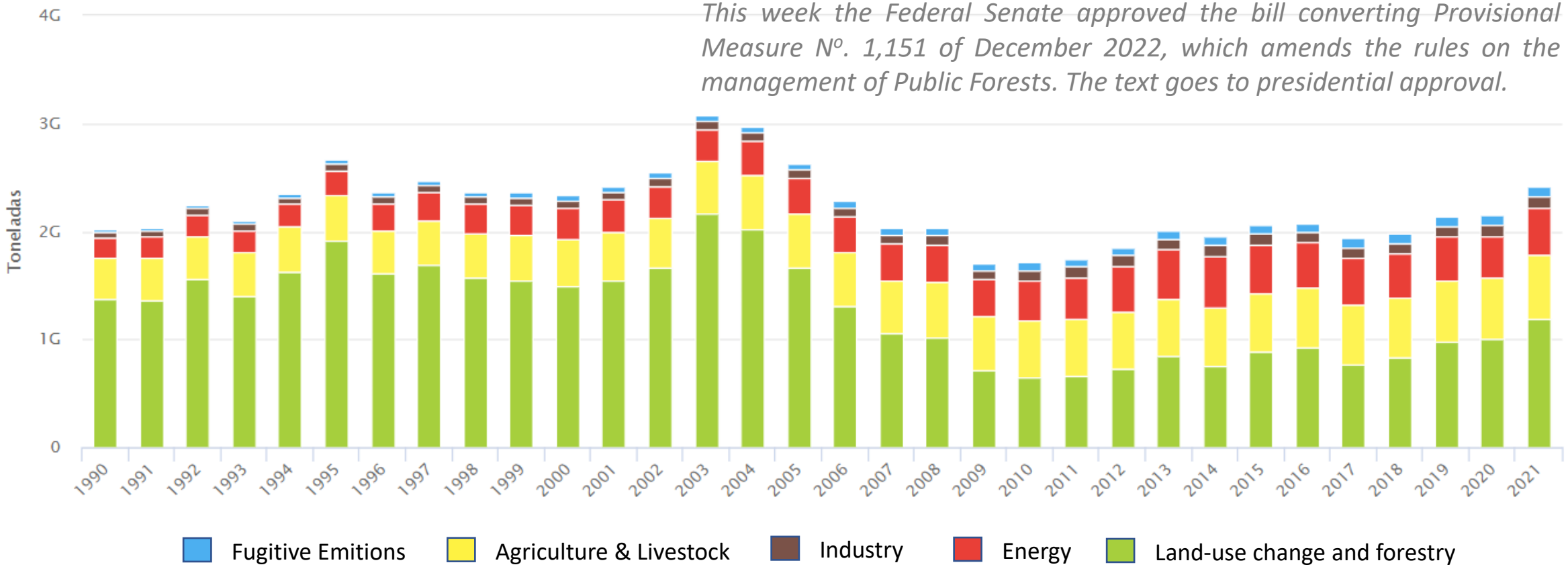
Brazil CO_{2e} Emissions by Sector, 1990-2022

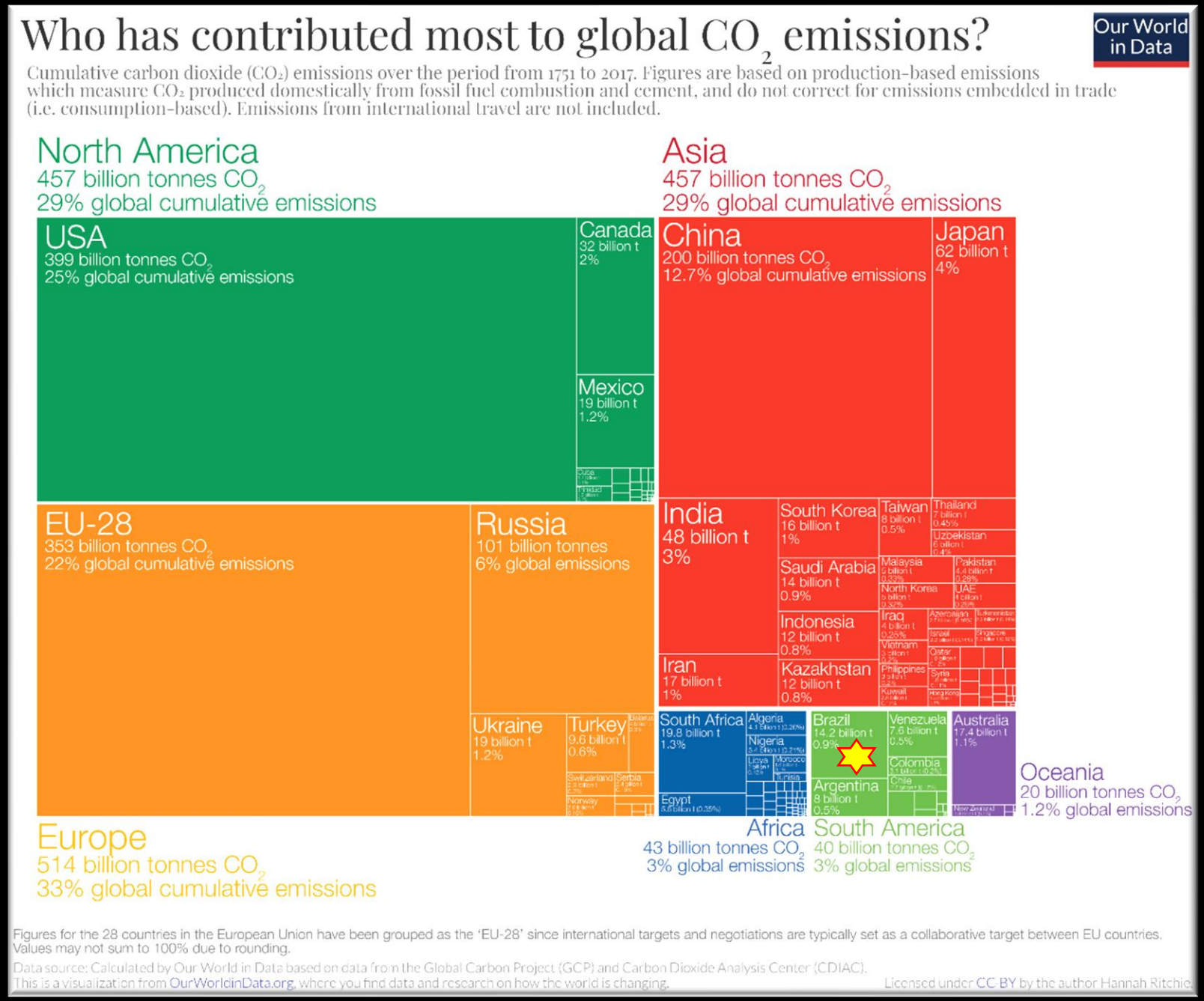
CO_{2e} (t)
GPW-AR6

"…Brazil's commitment to zero deforestation and calls for action by developed countries during climate and energy forum…"

Planalto (www.gov.br)

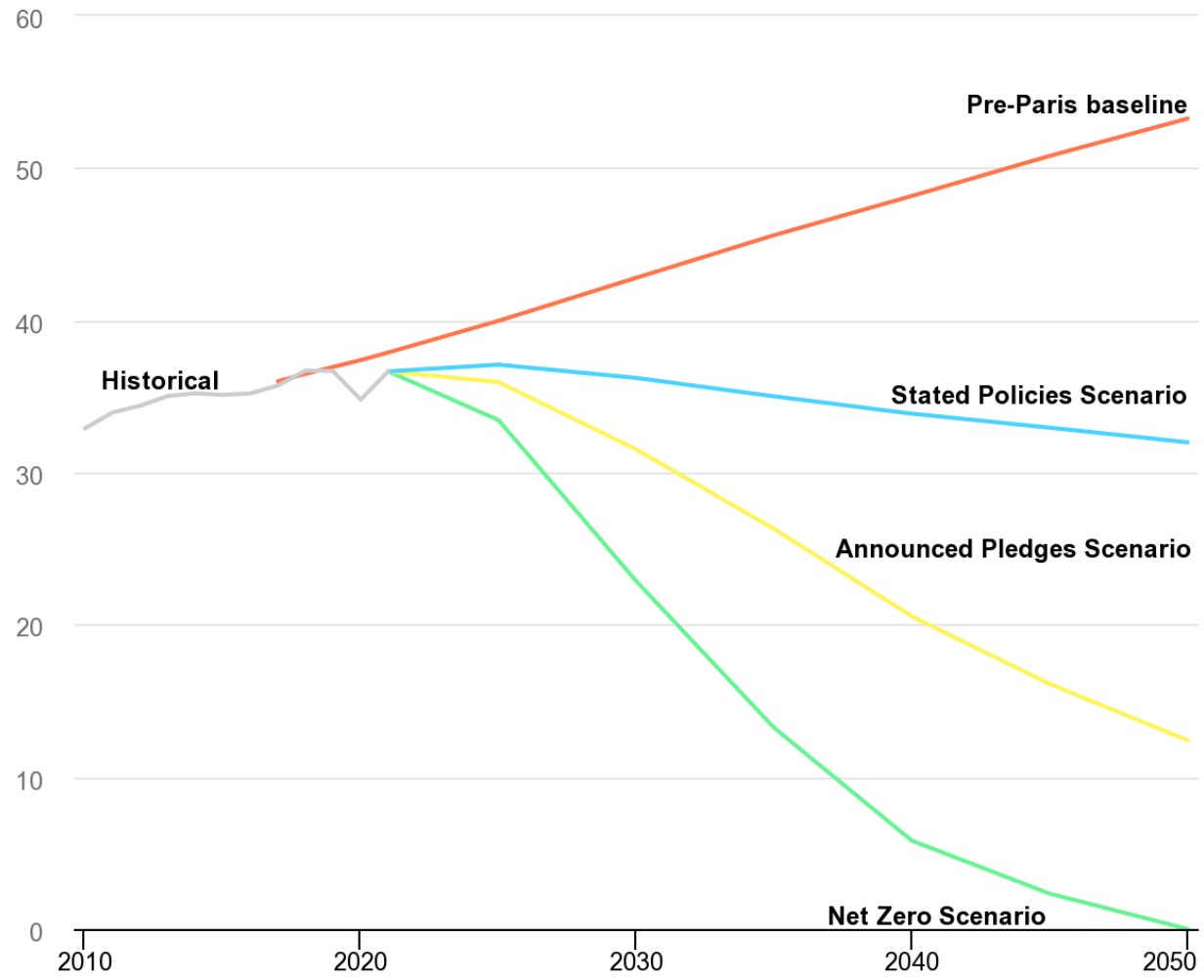
This week the Federal Senate approved the bill converting Provisional Measure Nº. 1,151 of December 2022, which amends the rules on the management of Public Forests. The text goes to presidential approval.





Common but Differentiated Responsibilities and Respective Capabilities

Meeting all net zero pledges on time (world)



Global climate goals 'virtually impossible' without carbon capture: IEA

https://www.reuters.com/article/us-iea-carboncapture-idUSKCN26F0IB

Energy-related and process CO2 emissions by scenario, 2010-2050; IEA. Licence: CC BY 4.0
https://www.iea.org/data-and-statistics/charts/energy-related-and-process-co2-emissions-by-scenario-2010-2050

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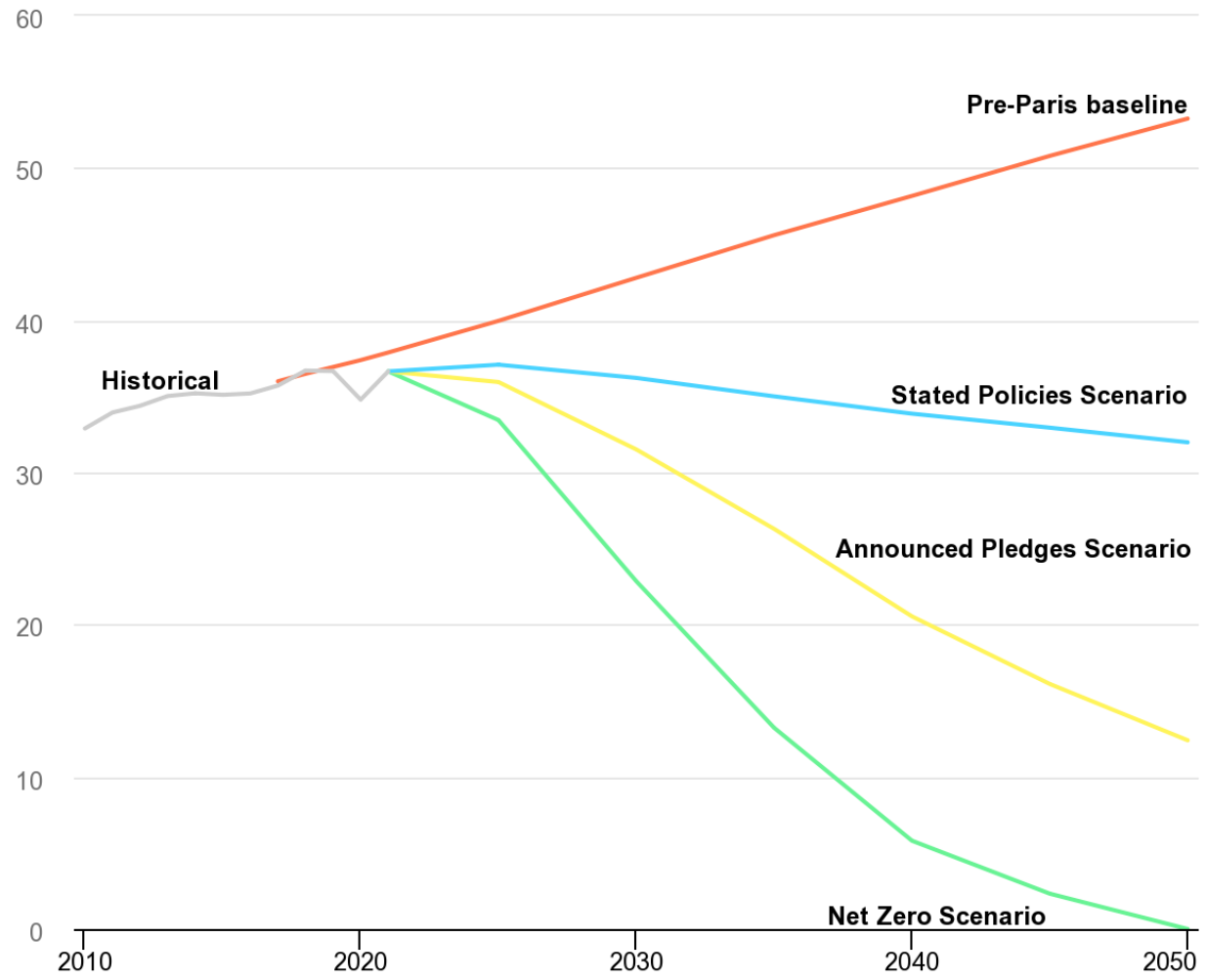
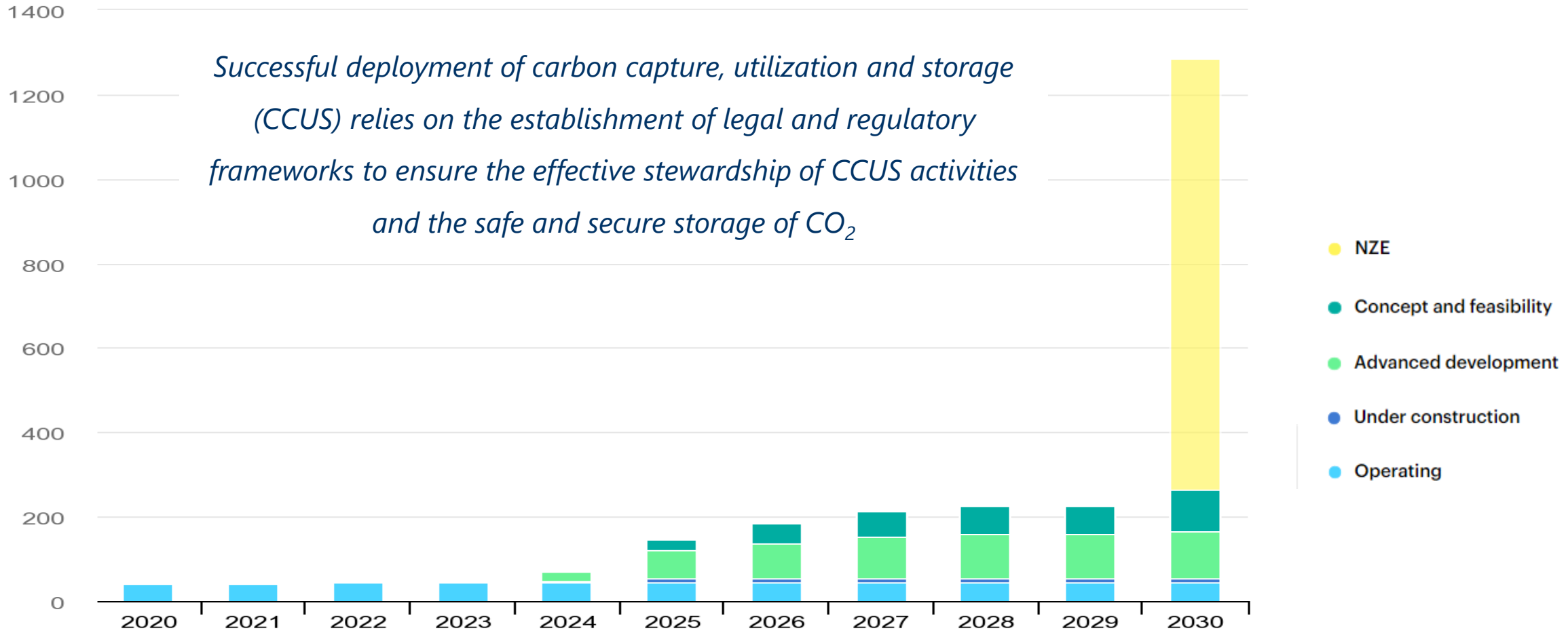


Energy-related and process CO2 emissions by scenario, 2010-2050; IEA. Licence: CC BY 4.0
https://www.iea.org/data-and-statistics/charts/energy-related-and-process-co2-emissions-by-scenario-2010-2050

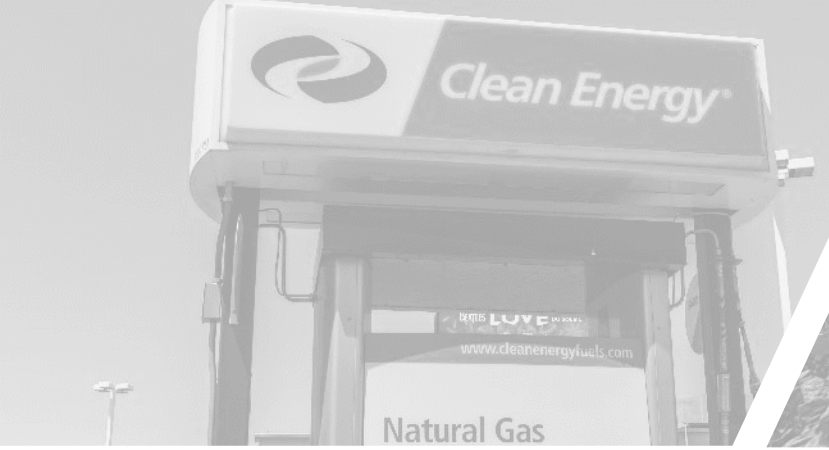
It's important to keep in mind that there isn't a one-size-fits-all solution!

CCUS TO NET-ZERO

Successful deployment of carbon capture, utilization and storage (CCUS) relies on the establishment of legal and regulatory frameworks to ensure the effective stewardship of CCUS activities and the safe and secure storage of CO_2



IEA 2023; Capacity of large-scale CO2 capture projects, current and planned vs. the Net Zero Scenario, 2020-2030
https://www.iea.org/data-and-statistics/charts/capacity-of-large-scale-co2-capture-projects-current-and-planned-vs-the-net-zero-scenario-2020-2030 , IEA. Licence: CC BY 4.0



Brazil is committed to achieving net-zero emissions and has signed the Paris Agreement and reinforced its compromises recently.

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E&P in Brazil

01 Supermajors
Major Operators

02 Major Operators
Exploration Specialists
Mature Field Players

03 Small and Medium
Companies

Productions Overview

Produção Nacional

Petróleo Equivalente (boe/d)	Petróleo Equivalente Variação Mês (%)	Petróleo Equivalente Variação Ano (%)
3.986.663,40	-4,70% ▼	4,18% ▲

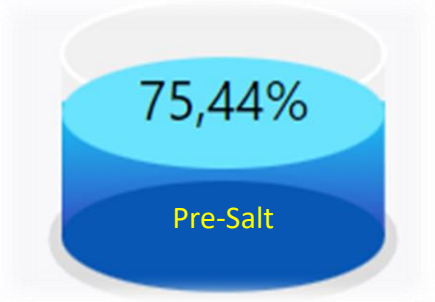
Petróleo (bbl/d)	Petróleo Variação Mês (%)	Petróleo Variação Ano (%)	Gás Natural (mil m3/d)	Gás Natural Variação Mês (%)	Gás Natural Variação Ano (%)
3.115.331,70	-4,48% ▼	4,50% ▲	138.530,69	-5,47% ▼	3,04% ▲

Produção Pré-sal

Petróleo Equivalente (boe/d)	Petróleo Equivalente Variação Mês (%)	Petróleo Equivalente Variação Ano (%)
3.007.428,35	-7,96% ▼	4,56% ▲

Petróleo (bbl/d)	Petróleo Variação Mês (%)	Petróleo Variação Ano (%)	Gás Natural (mil m3/d)	Gás Natural Variação Mês (%)	Gás Natural Variação Ano (%)
2.363.173,30	-7,91% ▼	4,21% ▲	102.428,38	-8,18% ▼	5,87% ▲

Equivalent Oil (bbl/d)

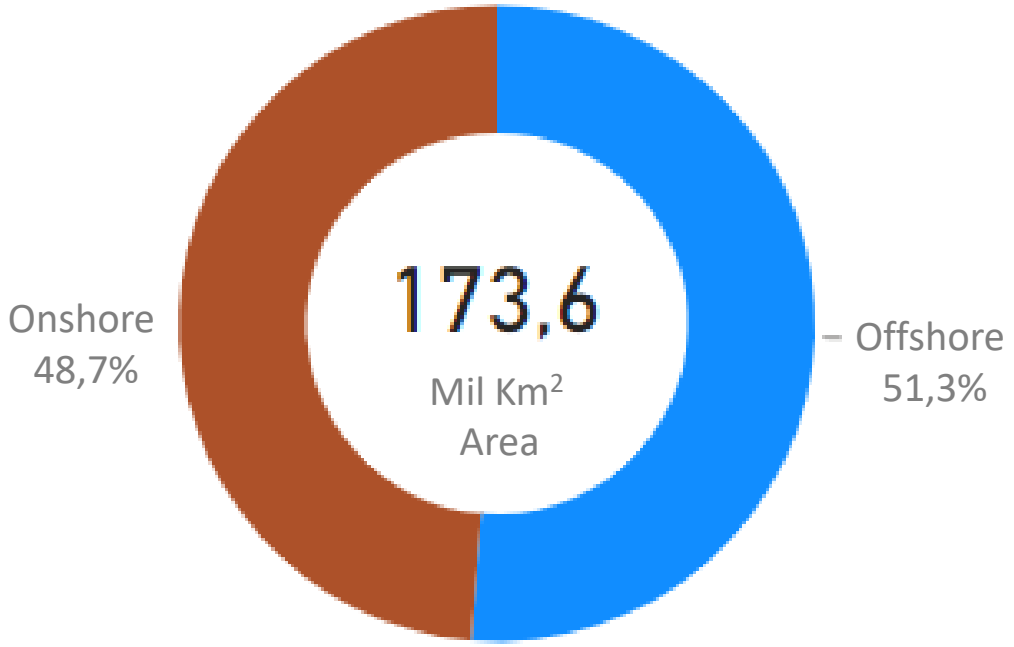


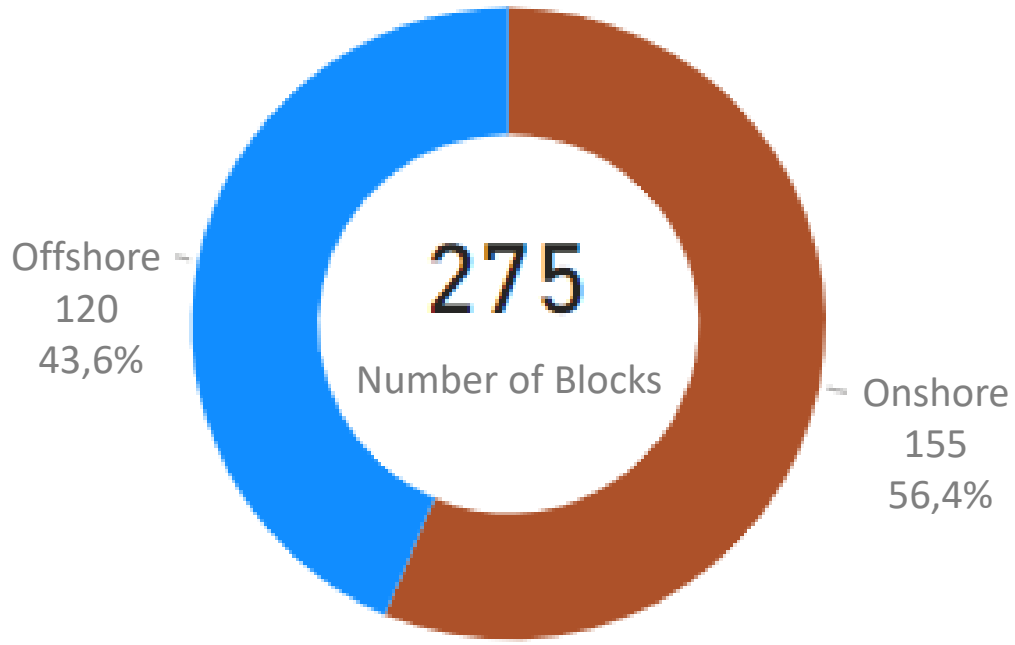
ANP 2023; Painéis Dinâmicos, Investimentos na Fase de Produção

https://app.powerbi.com/view?r=eyJrIjoiNzVmNzI1MzQtNTY1NC00ZGVhLTk5N2ItNzBkMDNhY2IxZTIxIiwidCI6IjQ0OTlmNGZmLTI0YTYtNGI0Mi1iN2VmLTEyNGFmY2FkYzkxMyJ9

Exploratory Blocks with Current Contract

83 Economic Groups in E&P (43 National, 40 Foreign)

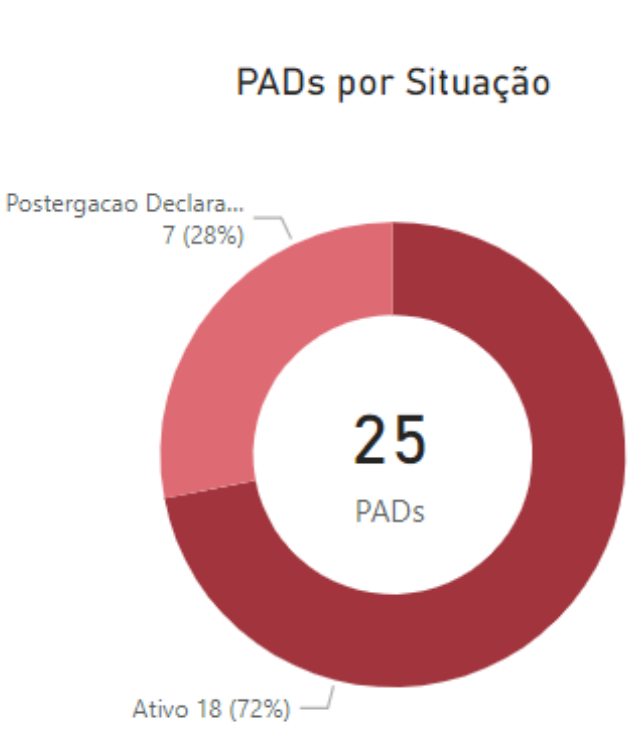


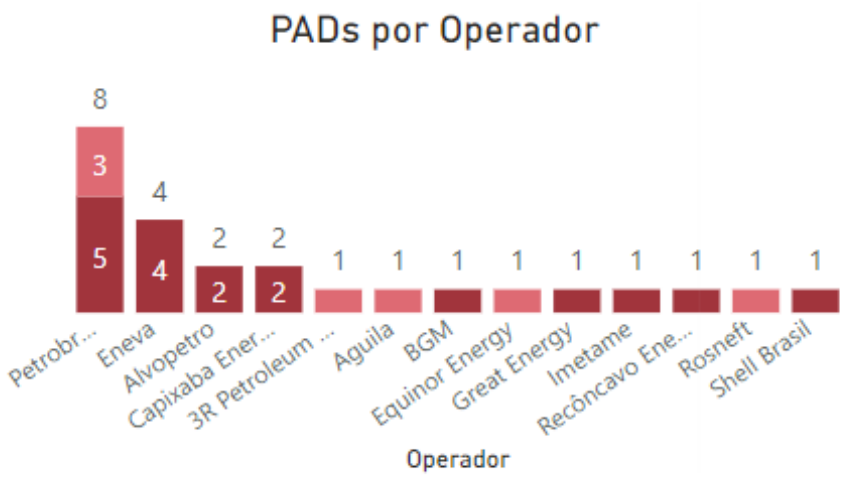


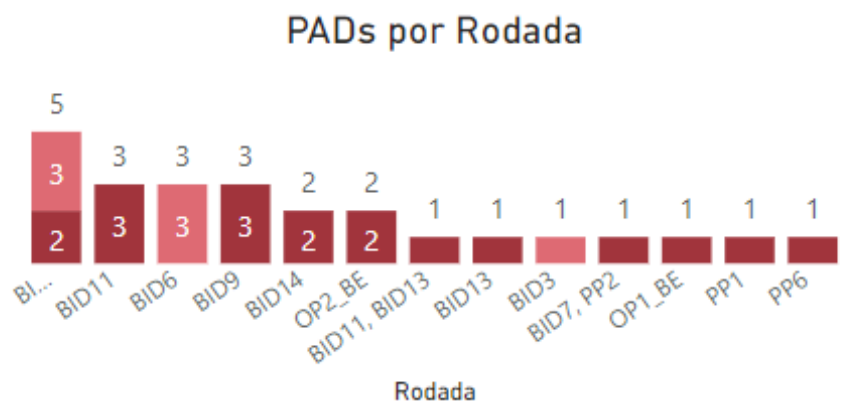
ANP 2023; Painéis Dinâmicos, Blocos sob Contrato

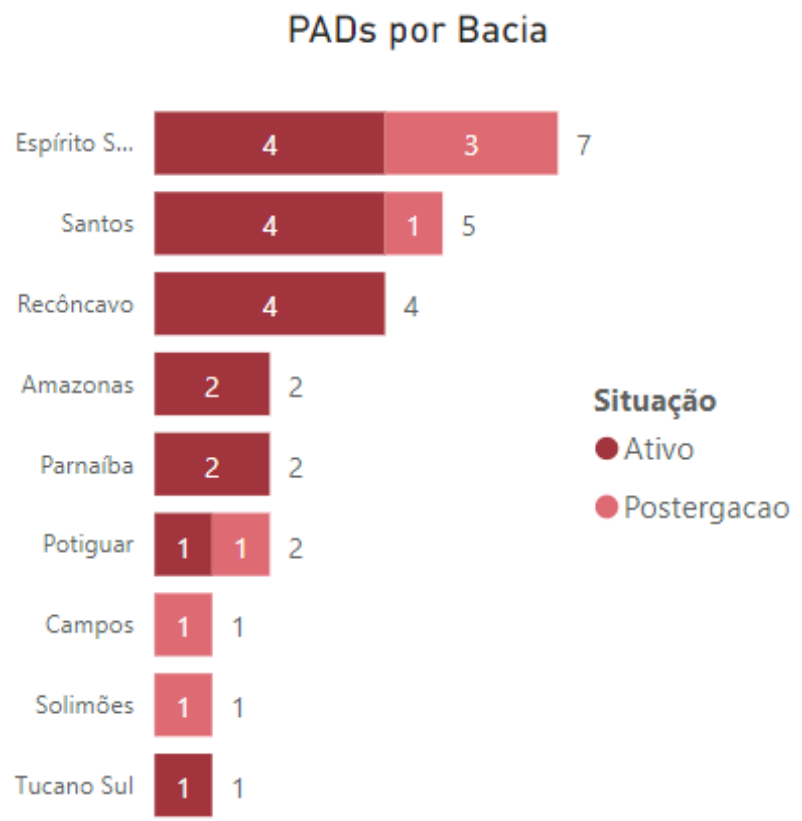
https://app.powerbi.com/view?r=eyJrIjoiYTEzY2U5YzItNzY0MC00NTgxLWExYjktODUwZGI0ZjJhNjIzIiwidCI6IjQ0OTlmNGZmLTI0YTYtNGI0Mi1iN2VmLTEyNGFmY2FkYzkxMyJ9

Ongoing Discovery Assessment Plans (PAD)



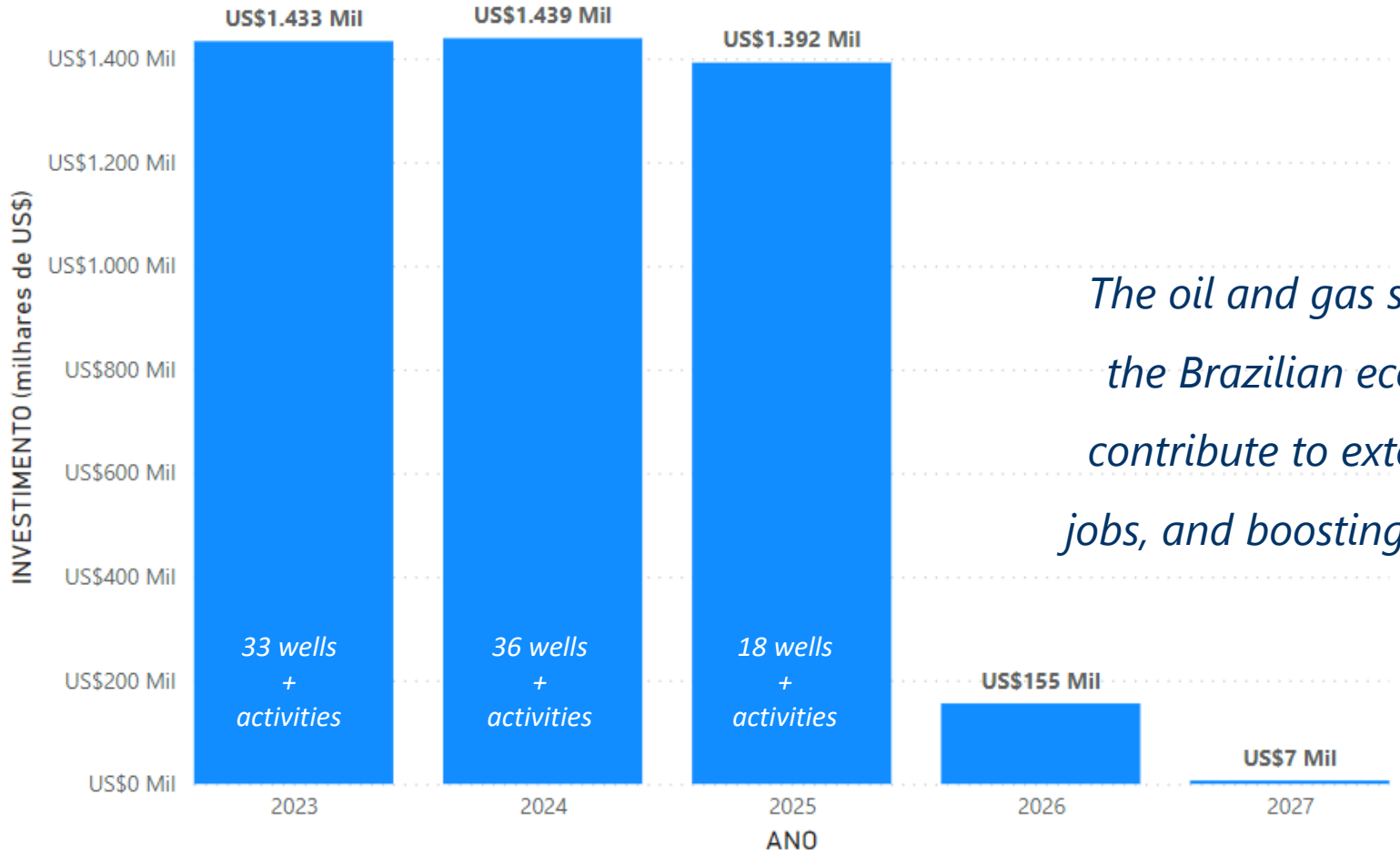






ANP 2023; Painéis Dinâmicos, Blocos sob Contrato
https://app.powerbi.com/view?r=eyJrIjoiYTEzY2U5YzItNzY0MC00NTgxLWExYjktODUwZGI0ZjJhNjIzIiwidCI6IjQ0OTlmNGZmLTI0YTYtNGI0Mi1iN2VmLTEyNGFmY2FkYzkxMyJ9

Investments in Exploratory Work Program – PAD & PEM (Res. ANP 876)

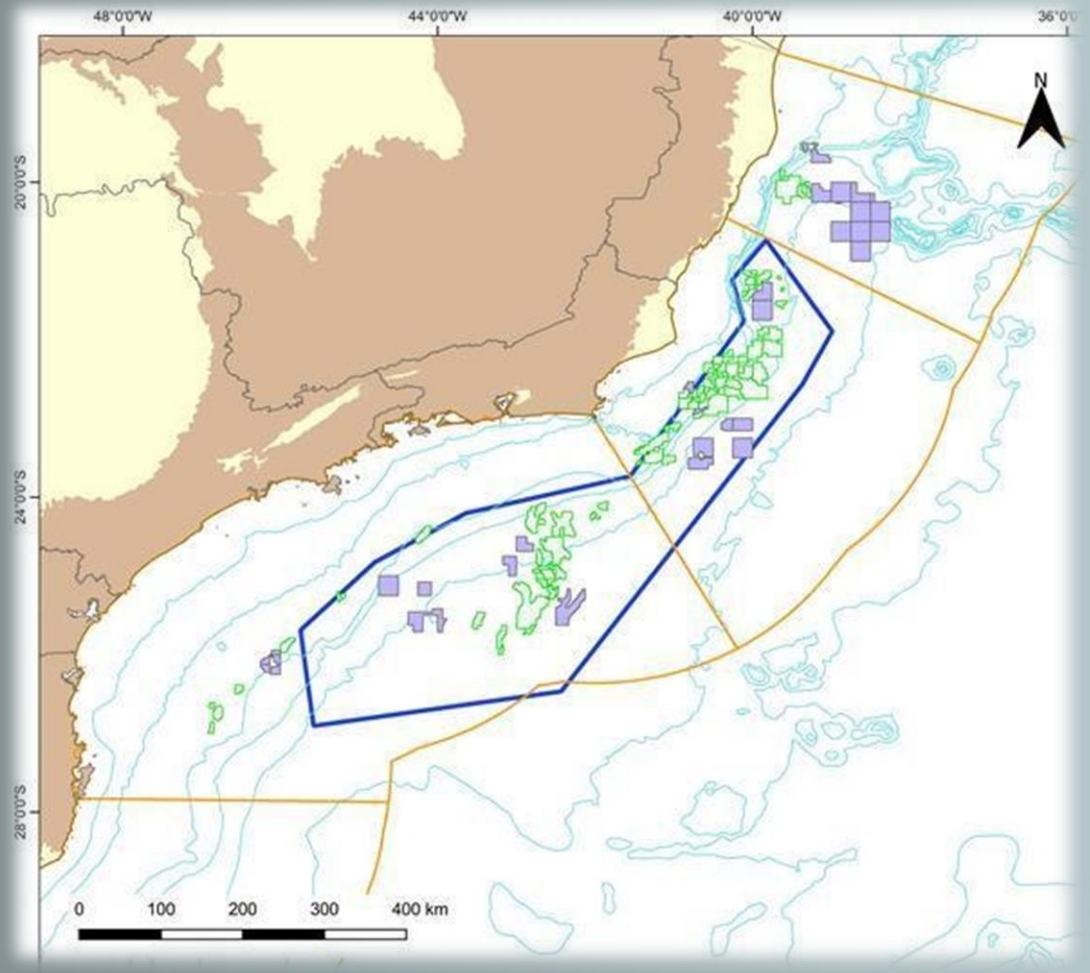


The oil and gas sector is one of the pillars of the Brazilian economy, and drill wells also contribute to extending reserves, generating jobs, and boosting technological development.

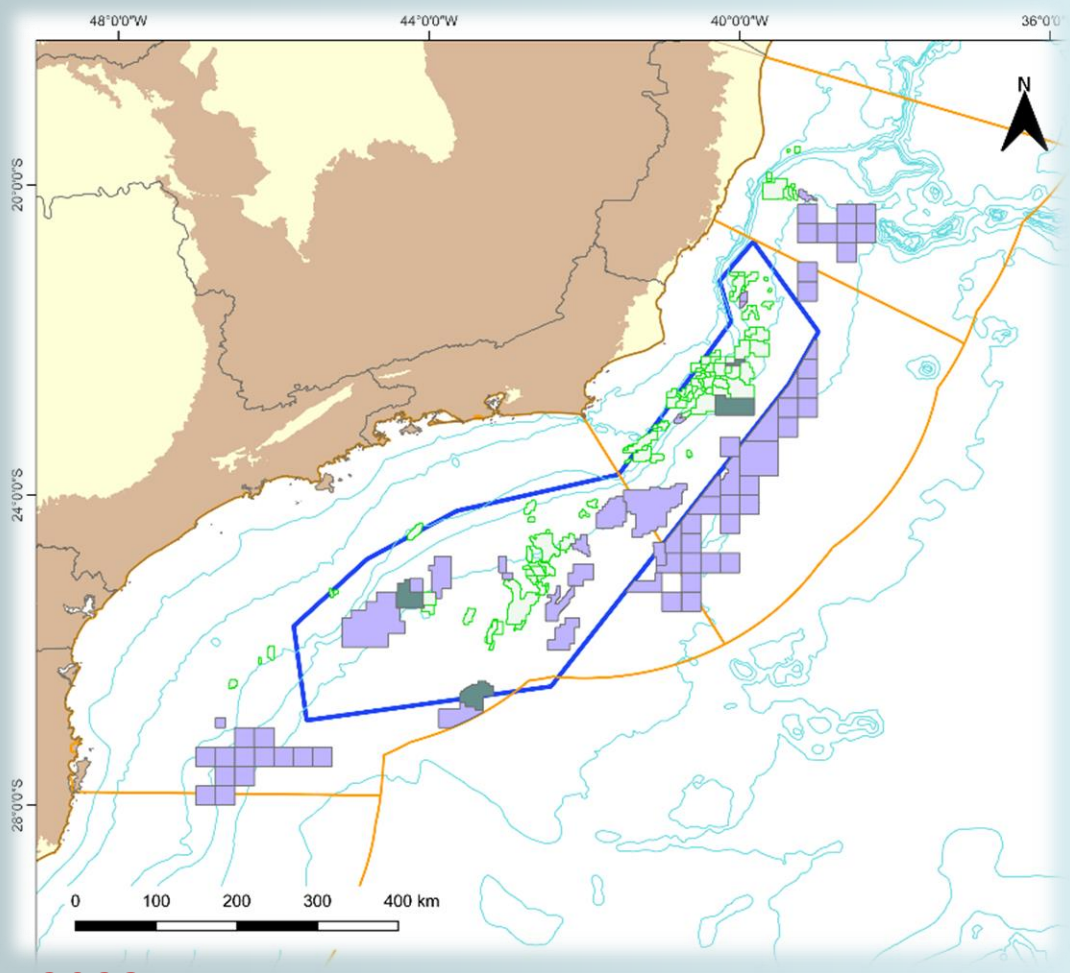
ANP 2023; Painéis Dinâmicos, Investimentos na Fase de Exploração

https://www.gov.br/anp/pt-br/centrais-de-conteudo/paineis-dinamicos-da-anp/paineis-dinamicos-sobre-exploracao-e-producao-de-petroleo-e-gas/painel-dinamico-da-previsao-de-atividades-e-investimentos-na-fase-de-exploracao

Contracts – Santos and Campos Basin

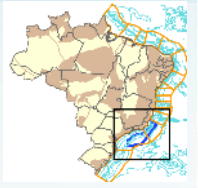


2016

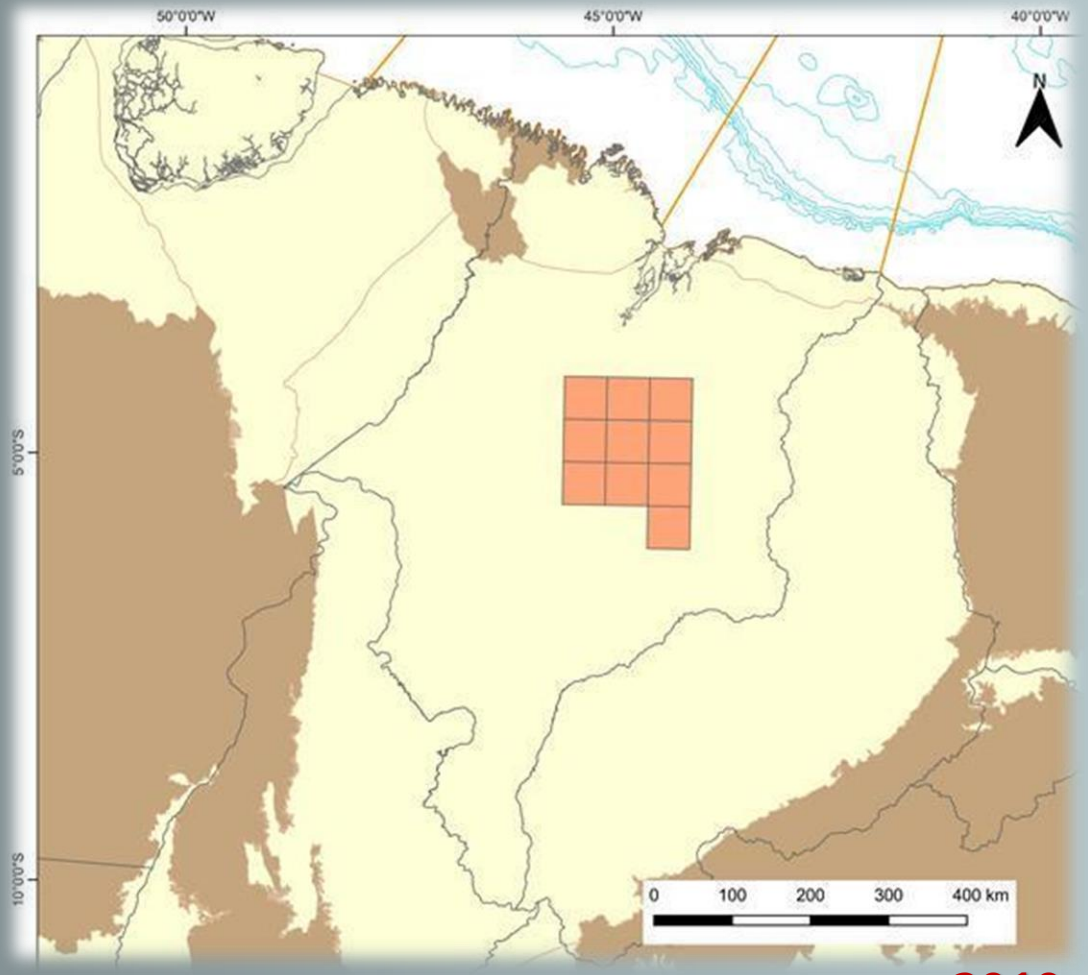


2023

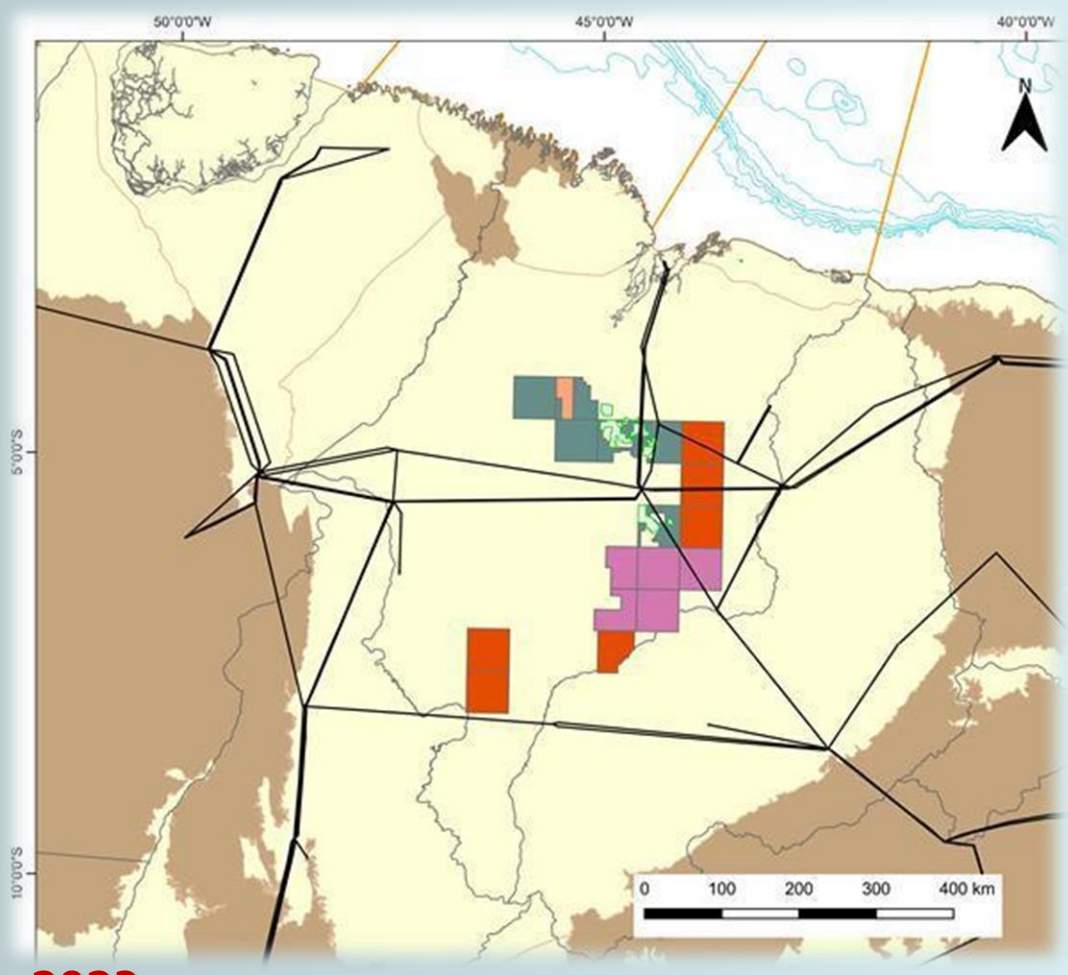
Block Block - OPP Field Pre-Salt Polygon



Contracts – Parnaiba Basin



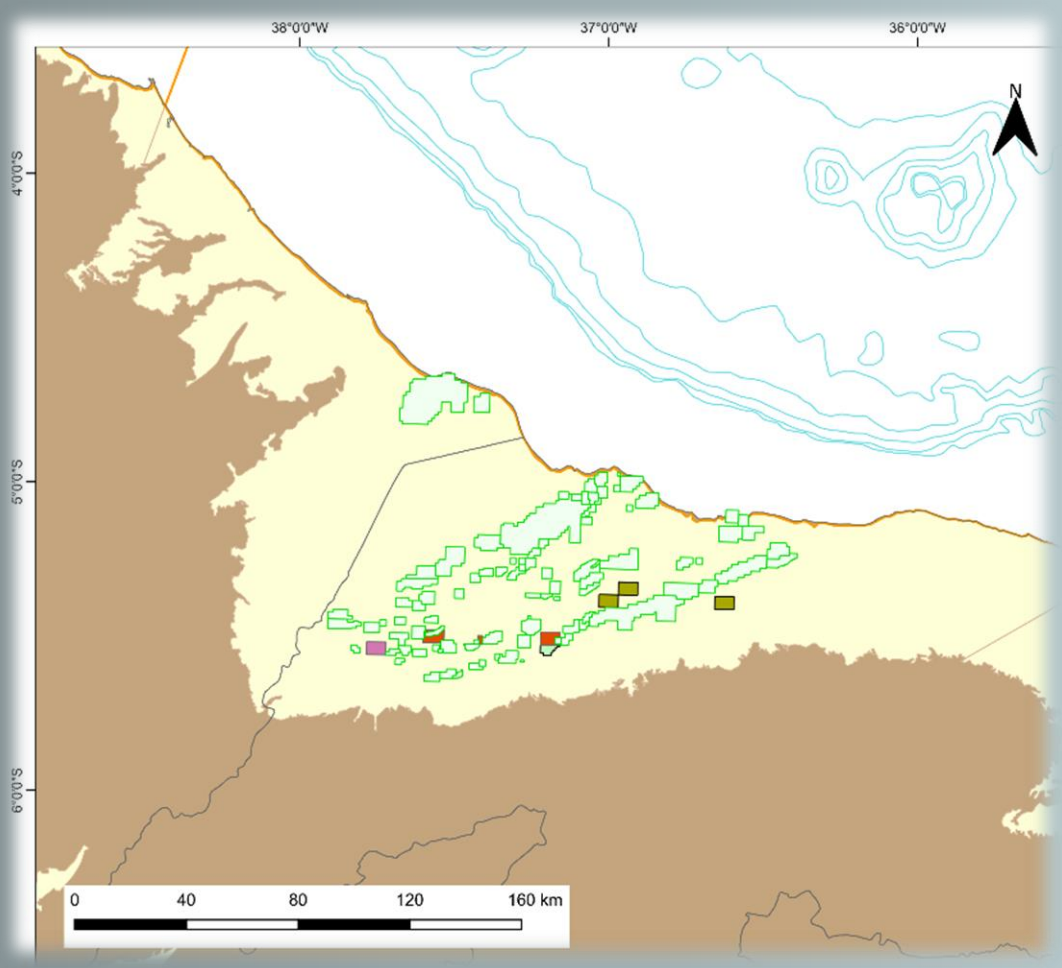
2010



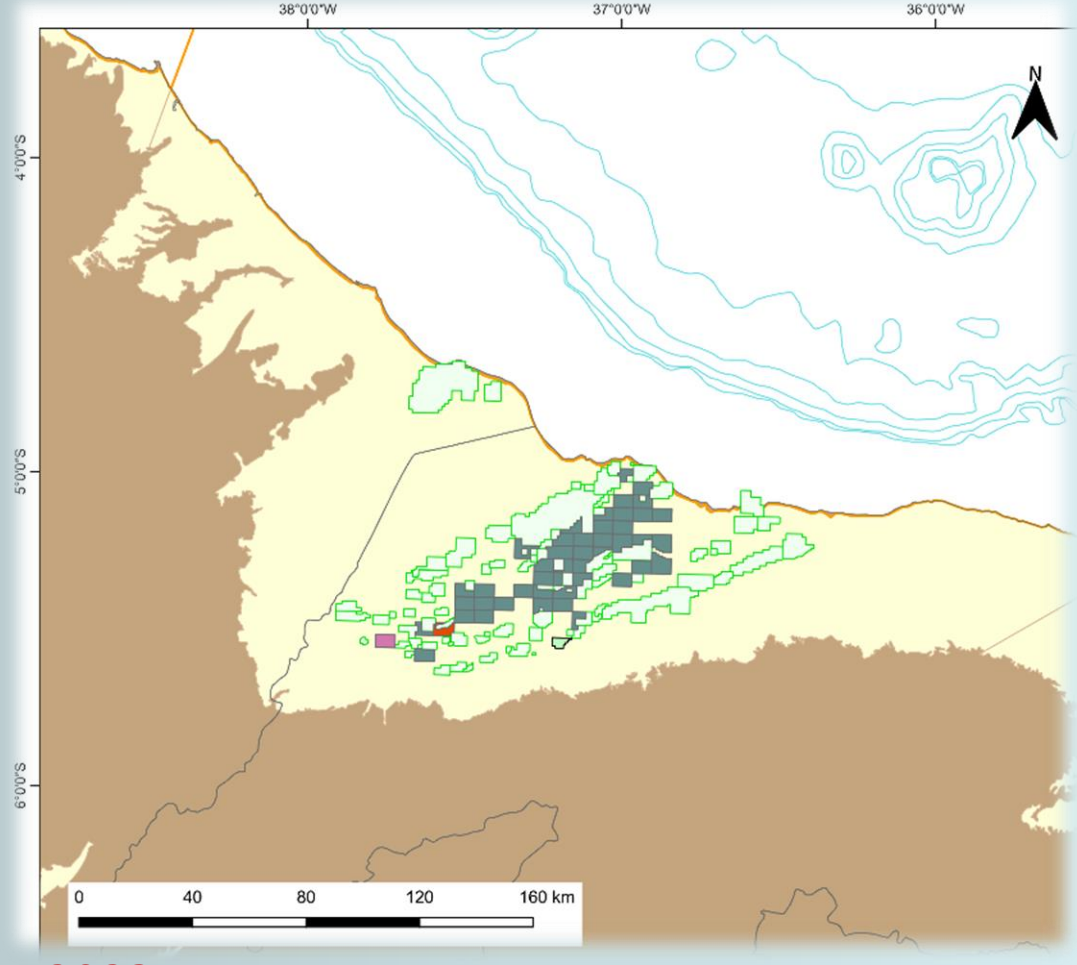
2023

Round 9 Round 13 Round 14 OPC Field Electrical transmission line

Contracts – Potiguar Onshore Basin



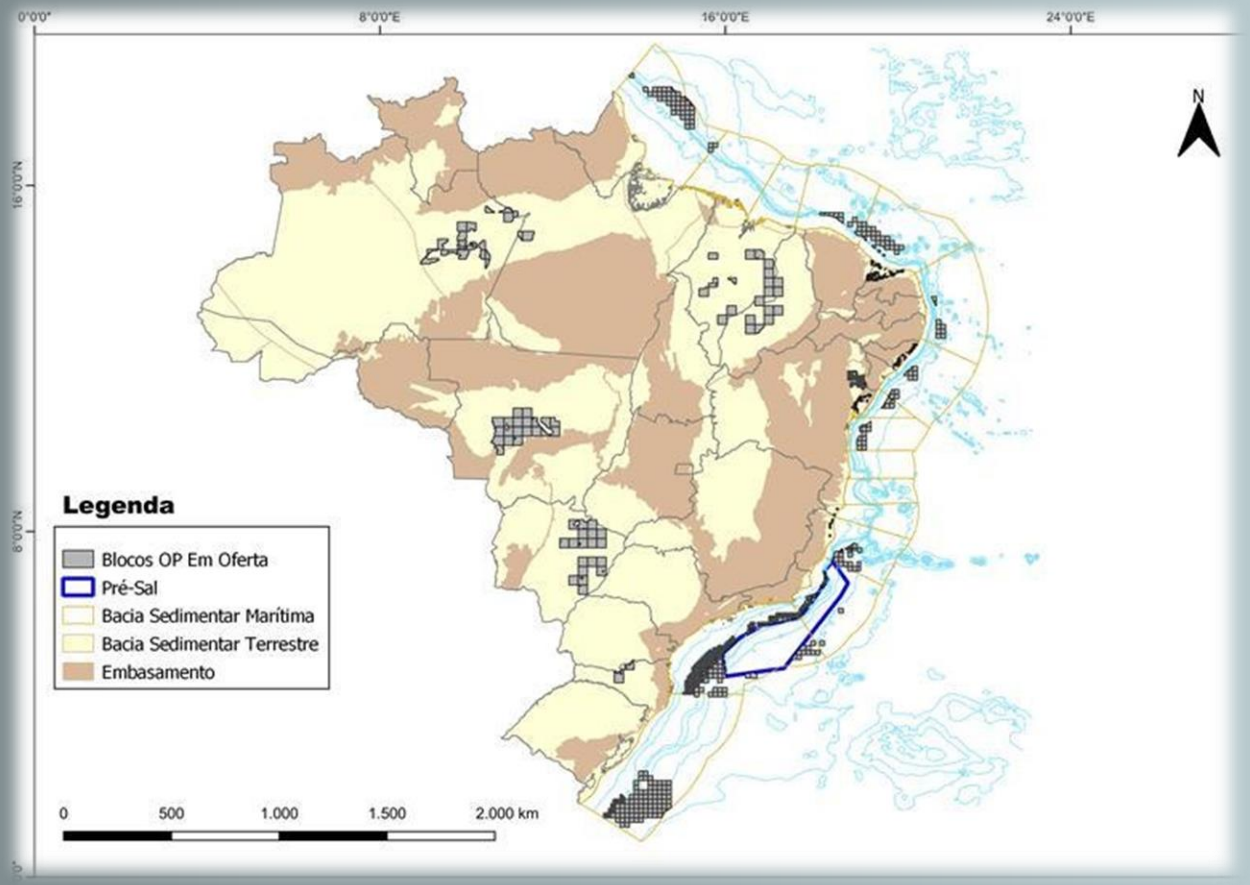
2019

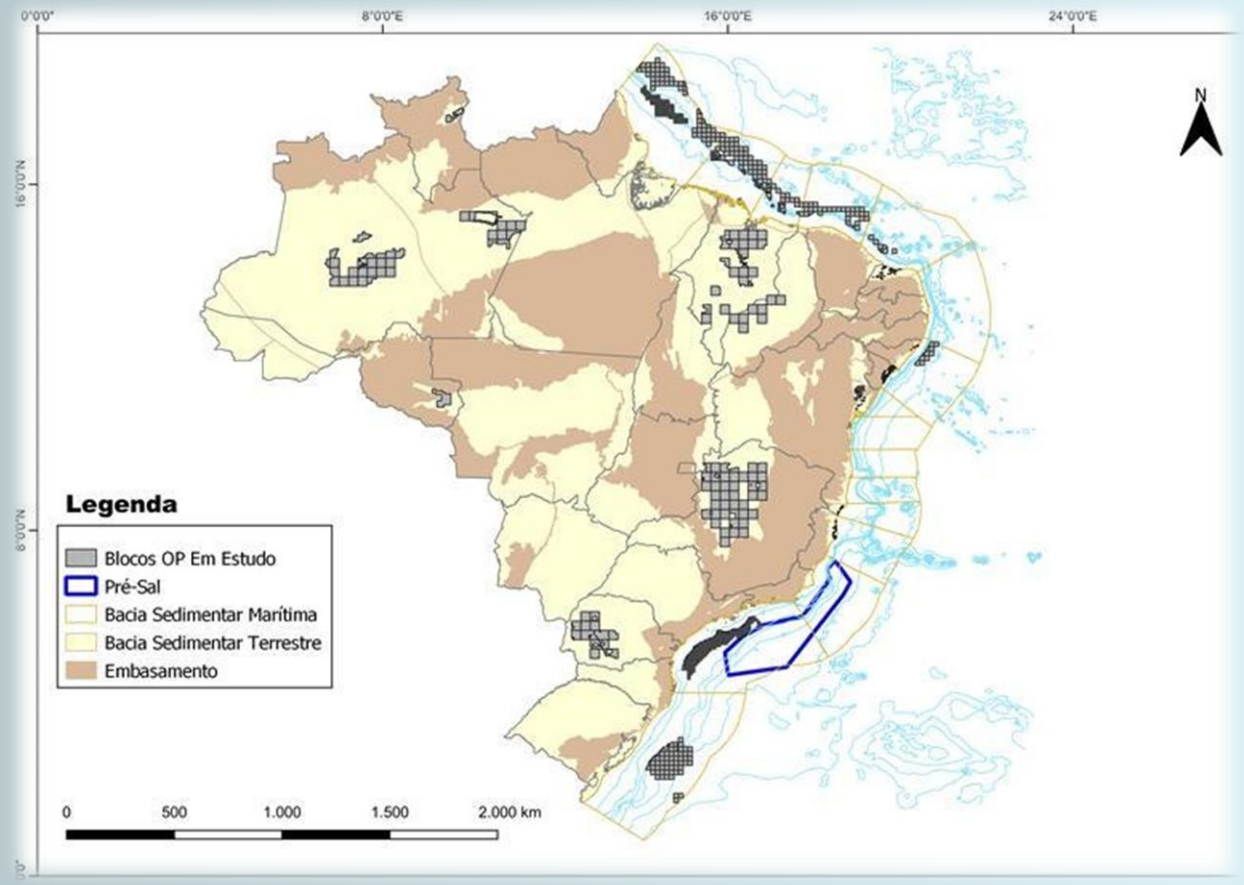


2023

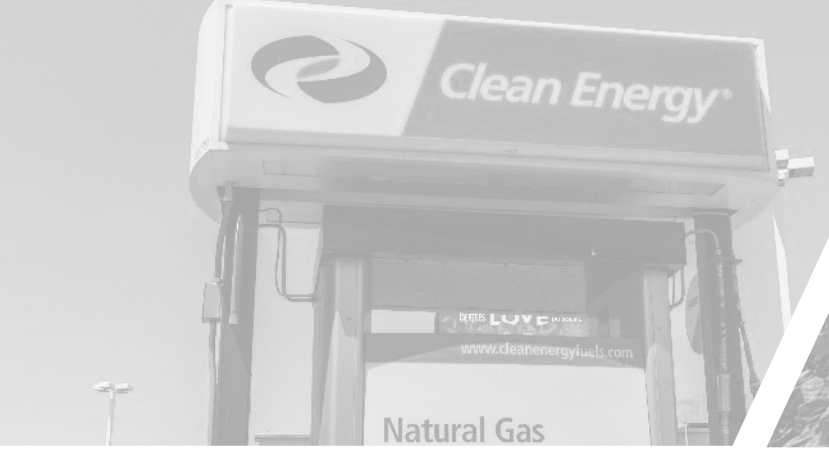
Round 7 Round 11 Round 13 Round 14 OPC Field

Open Acreage – Permanent Offer (OPC)





On Offer 2023 On Study



Brazil has been steadily growing its hydrocarbon production and spreading investments throughout the country, opening exploratory areas for fair competition.

Agenda

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Brazil´s Energy Mix

World Consumption and Fossil Fuel Demands

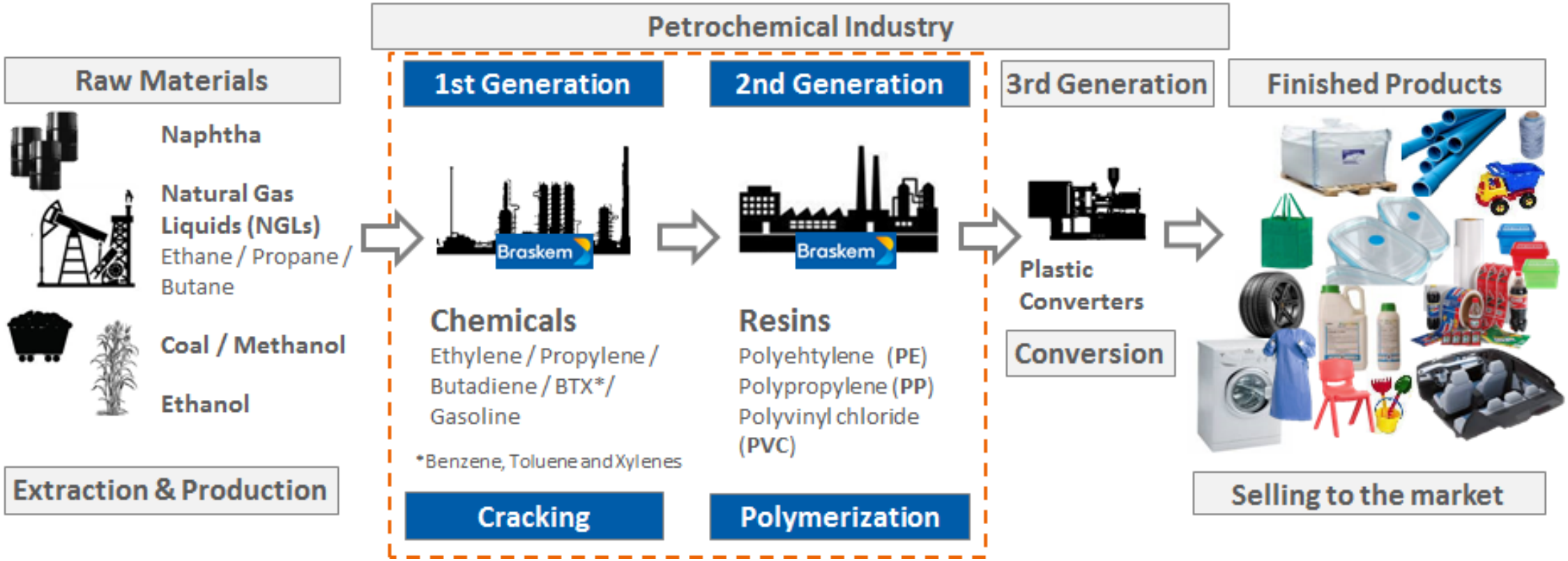
GHG (Focused on CO_2)

Brazil E&P Overview

The Importance of E&P in the Energy Transition

Final Remarks

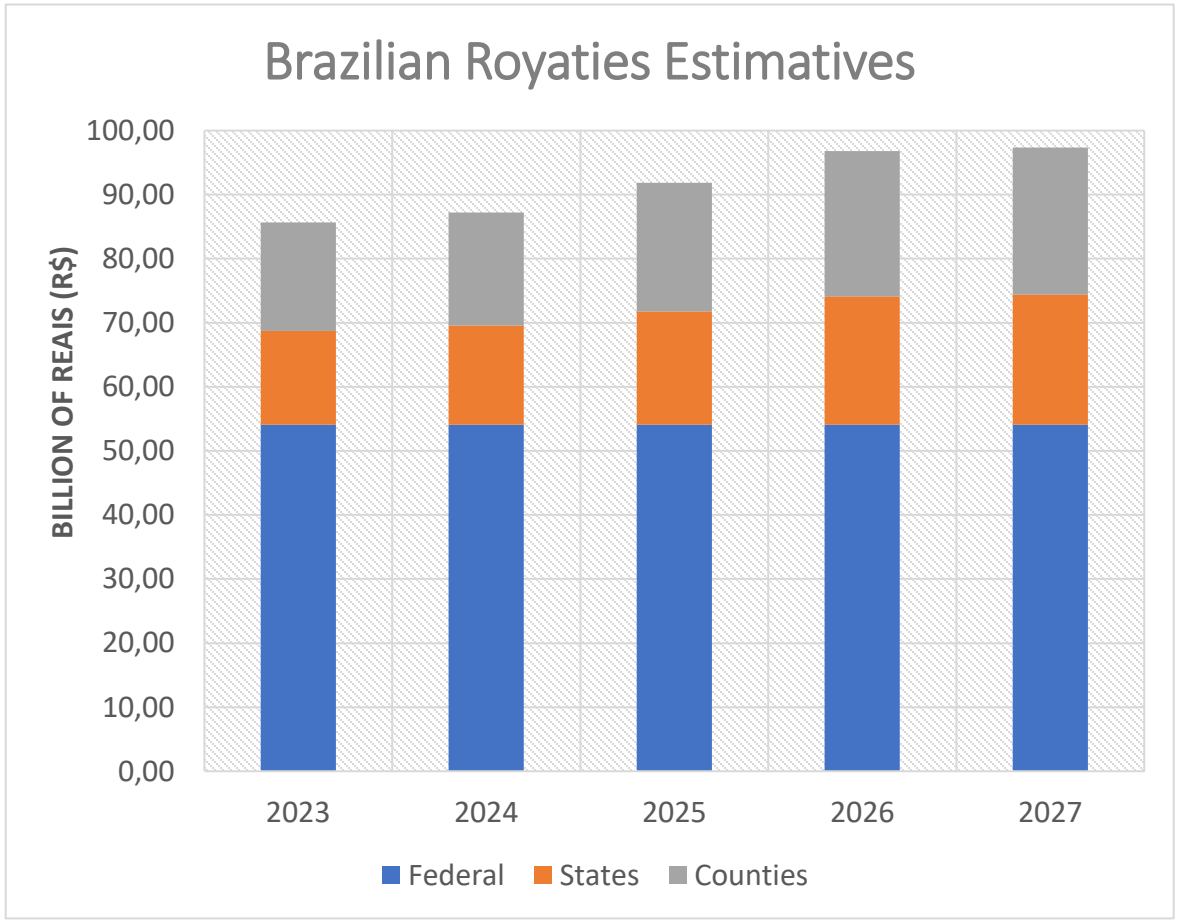
Petrochemical

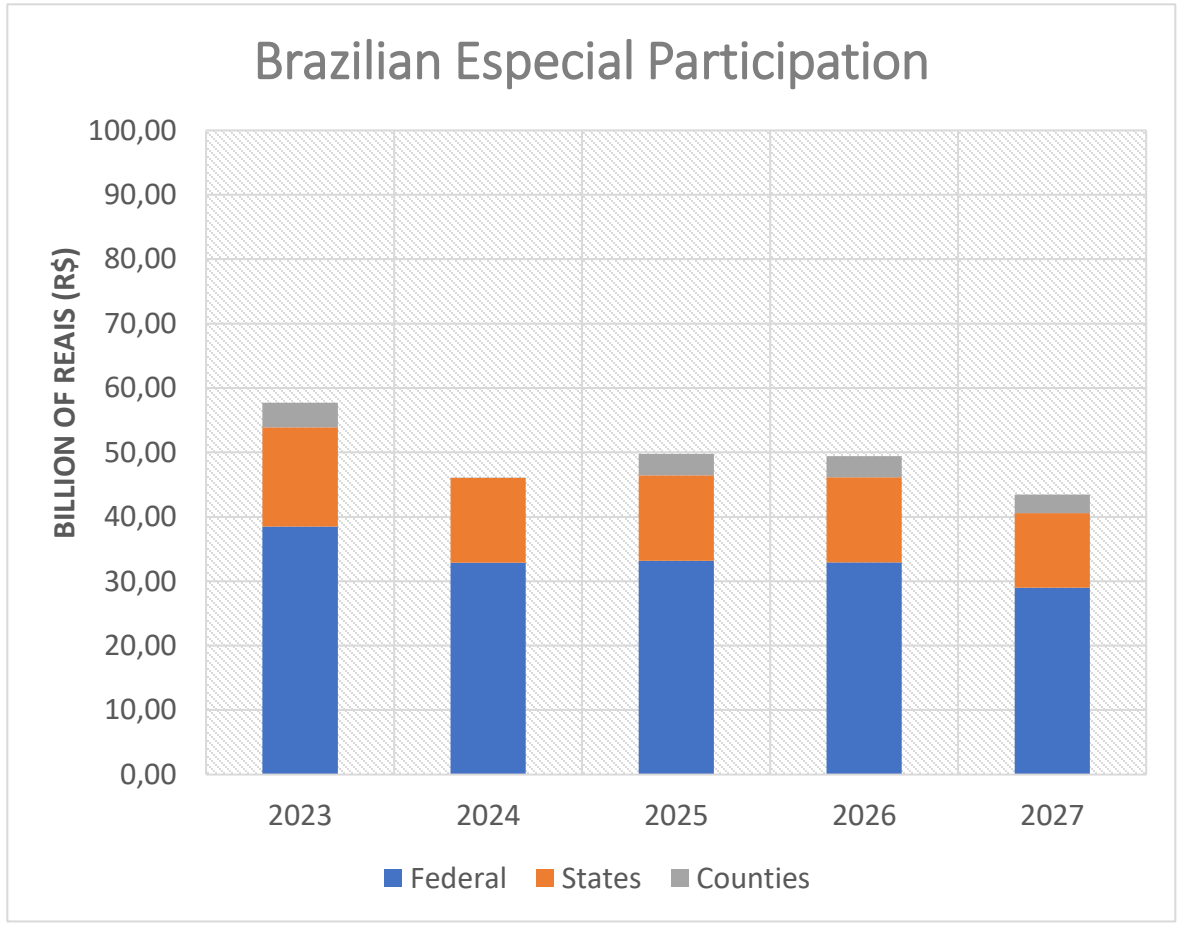


Petrochemical Manufacturing Process

[Industry Paper - Petrochemicals Industry - WalkWater Talent Advisors]

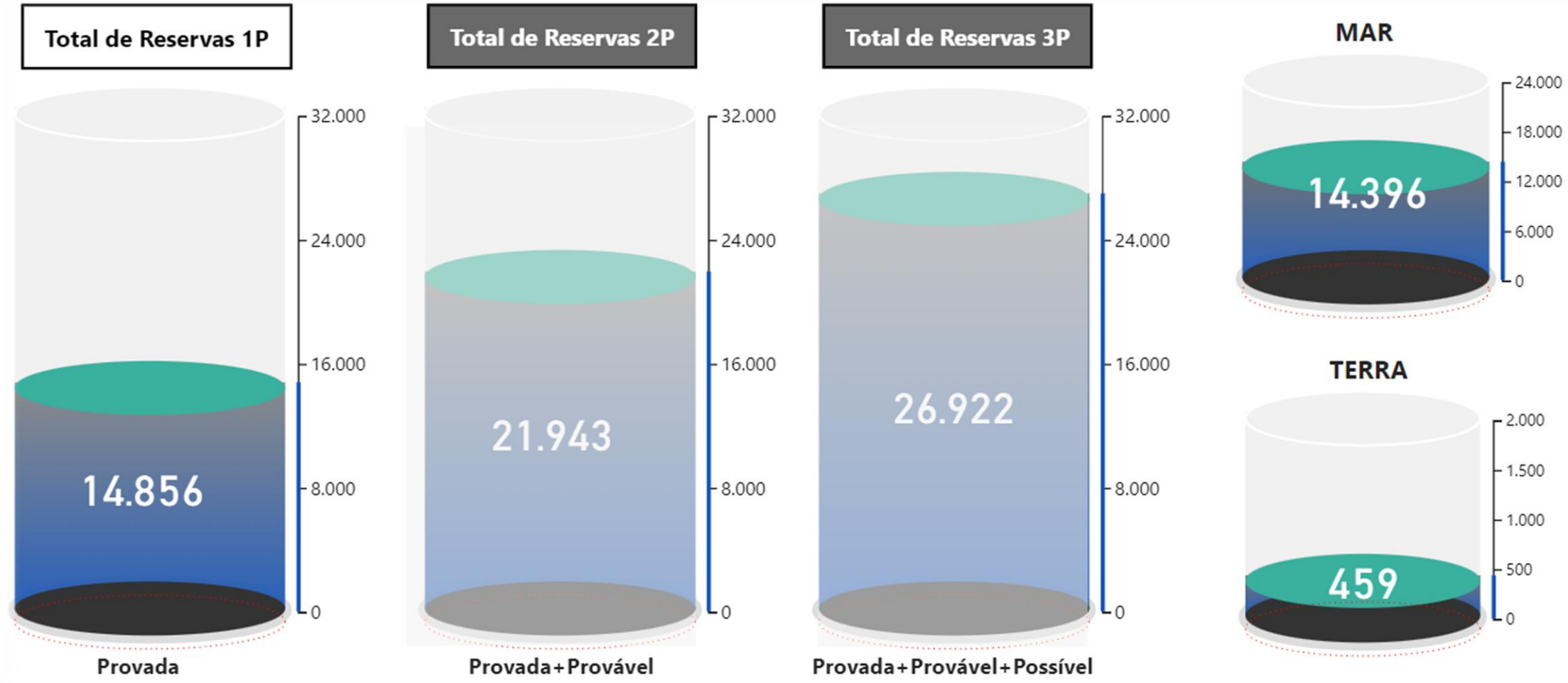
Government Takes





ANP 2023; Painéis Dinâmicos
https://app.powerbi.com/view?r=eyJrIjoiYWZhMjZmNWMtMjU4ZS00MWM4LWI3ZDAtYzgzYTE5MmI4N2I2IiwidCI6IjQ0OTlmNGZmLTI0YTYtNGI0Mi1iN2VmLTEyNGFmY2FkYzkxMyJ9

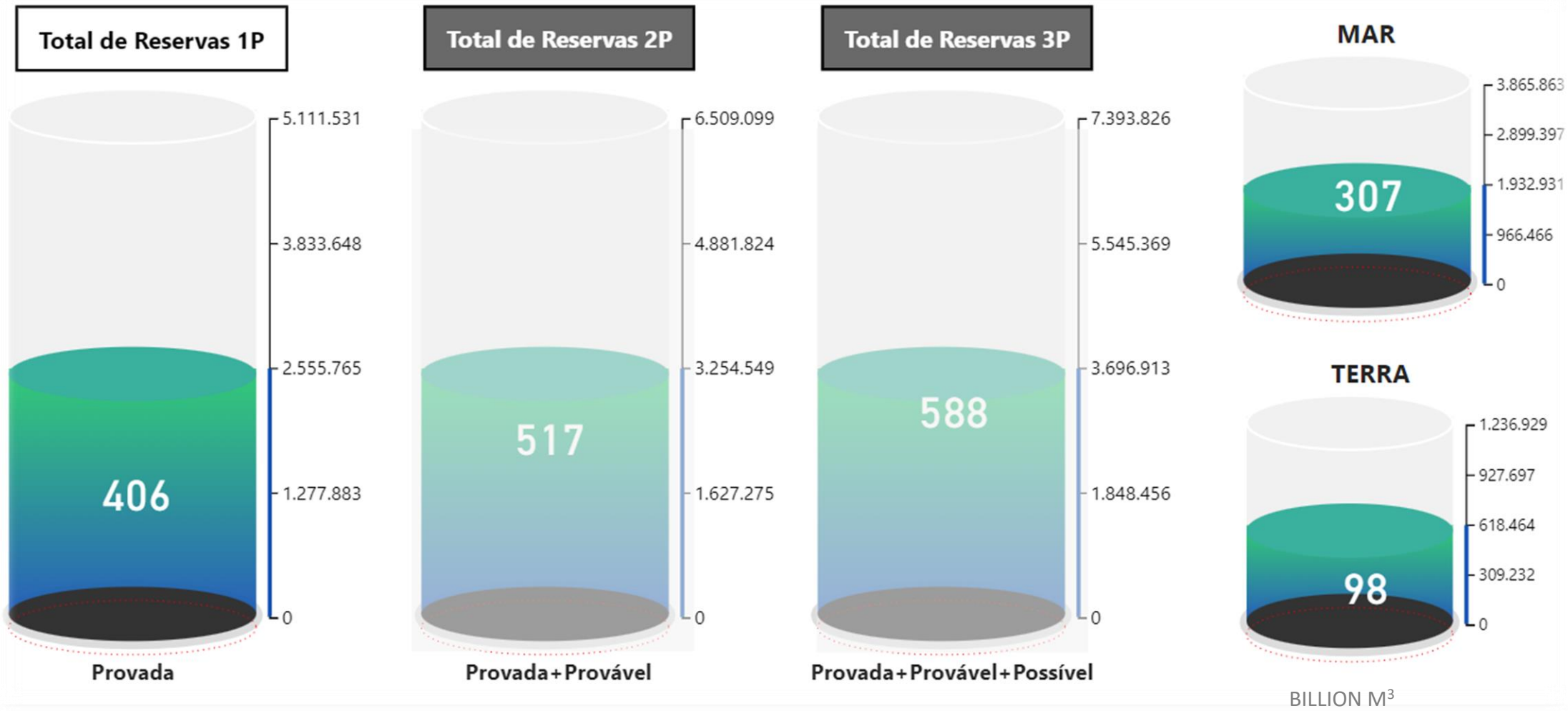
Oil Volumes – 2022 Reserves (1P; 2P; 3P)



BILLION BBL

ANP 2023; Painéis Dinâmicos, Reserves
https://app.powerbi.com/view?r=eyJrIjoiMjk1ZDA3YmUtZjc5ZC00NjIzLWFhY2QtMWZkODAxOGJiMGFjIiwidCI6IjQ0OTlmNGZmLTI0YTYtNGI0Mi1iN2VmLTEyNGFmY2FkYzkxMyJ9

Gas Volumes – 2022 Reserves (1P; 2P; 3P)



ANP 2023; Painéis Dinâmicos, Reserves
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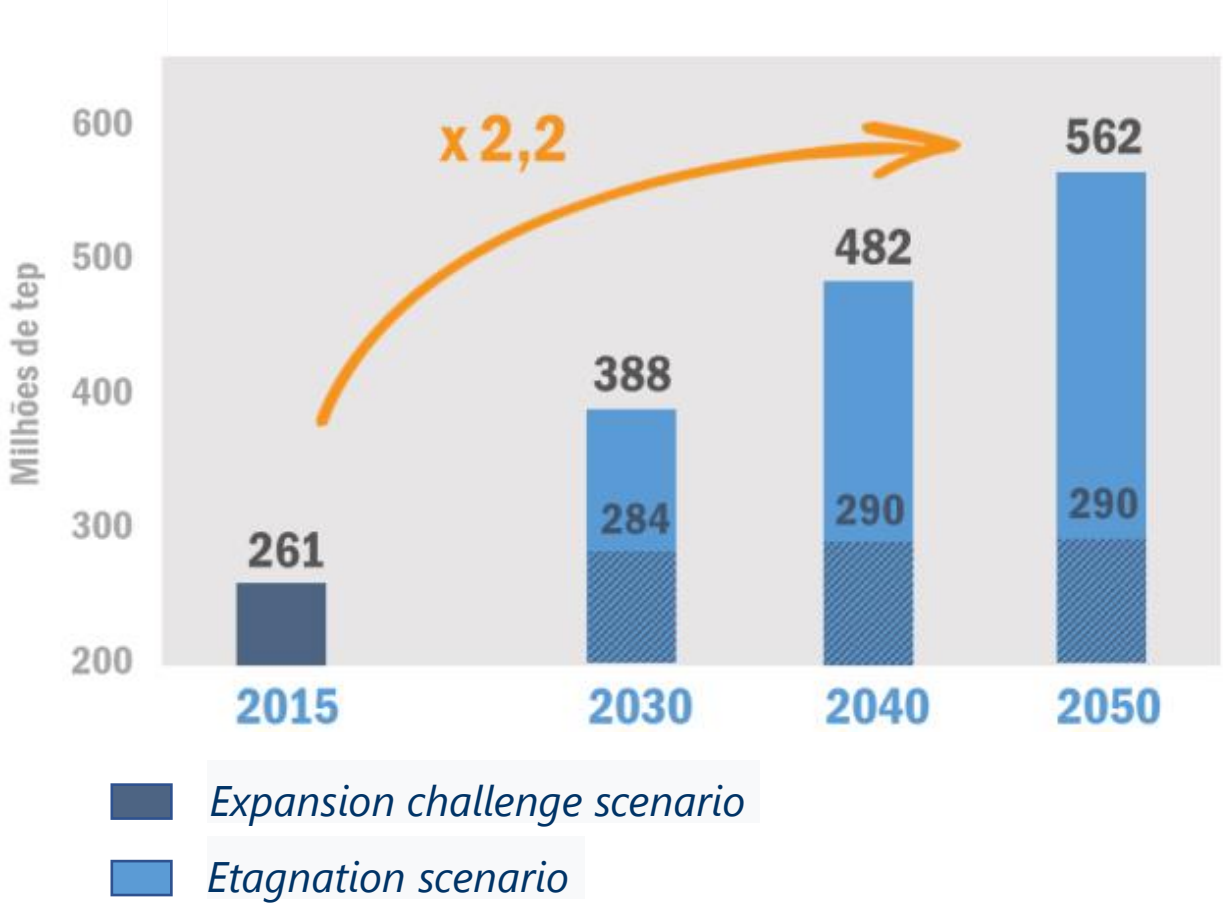
Projections

- *The Federal Government´s forecast indicates a significant increase in future oil production, to 5.2 million b/d in 2031. This volume is considerably higher than the 2.9 million b/d average registered in 2021. Natural gas is also forecast to increase from 134 million m3 /d in 2021 to 276 million m3 /d.*

Brazilian Oil & Gas Report 2021/2022, pg. 8
BOR 2022.pdf (epe.gov.br)

Scenarios of Final Energy Consumption Evolution in Brazil, 2015-**2050**

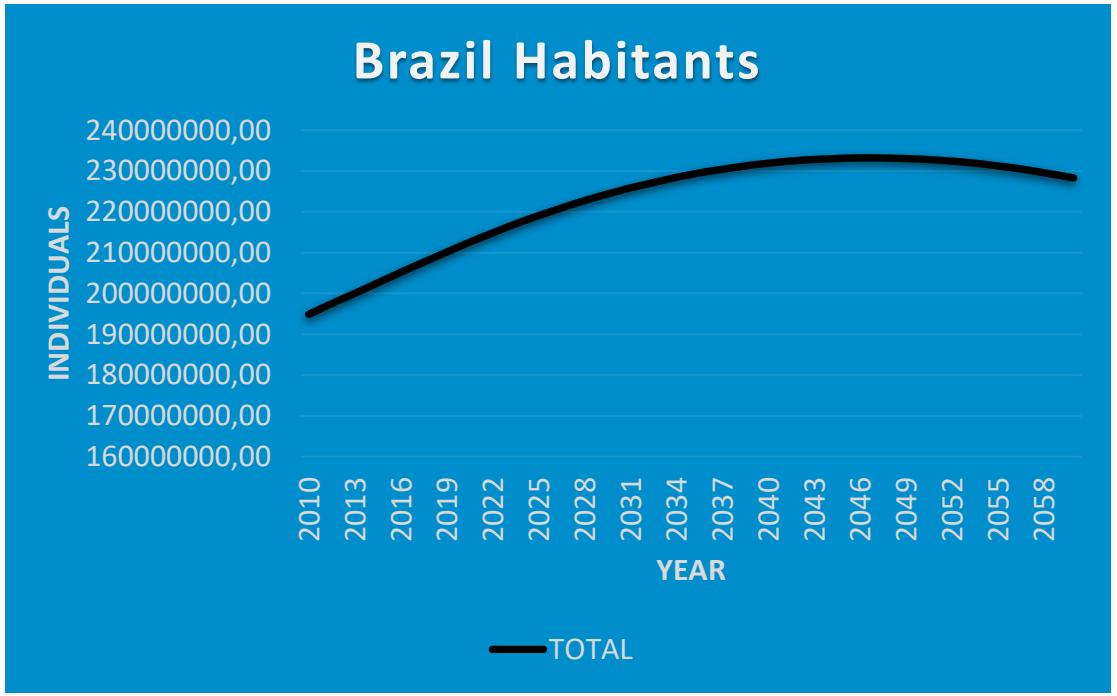


Extracted from EPE- PNE 2025, pg. 35
https://www.epe.gov.br/sites-pt/publicacoes-dados-abertos/publicacoes/PublicacoesArquivos/publicacao-227/topico-563/Relatorio%20Final%20do%20PNE%202050.pdf

Two potential scenarios for the evolution of energy consumption towards its final state.

Decarbonization!
Energy security!
Fair and sustainable energy transition!

Brazilian Population, 2023-**2050**



Extracted from
https://www.ibge.gov.br/estatisticas/sociais/populacao/9109-projecao-da-populacao.html?=&t=resultados

IBGE (2022) reported that Brazil's population is around 215 million people and is expected to grow by 8% before 2050. This projection suggests an increase of 18 million individuals, which is equal to the population of Ecuador or more than five times the population of Uruguay.

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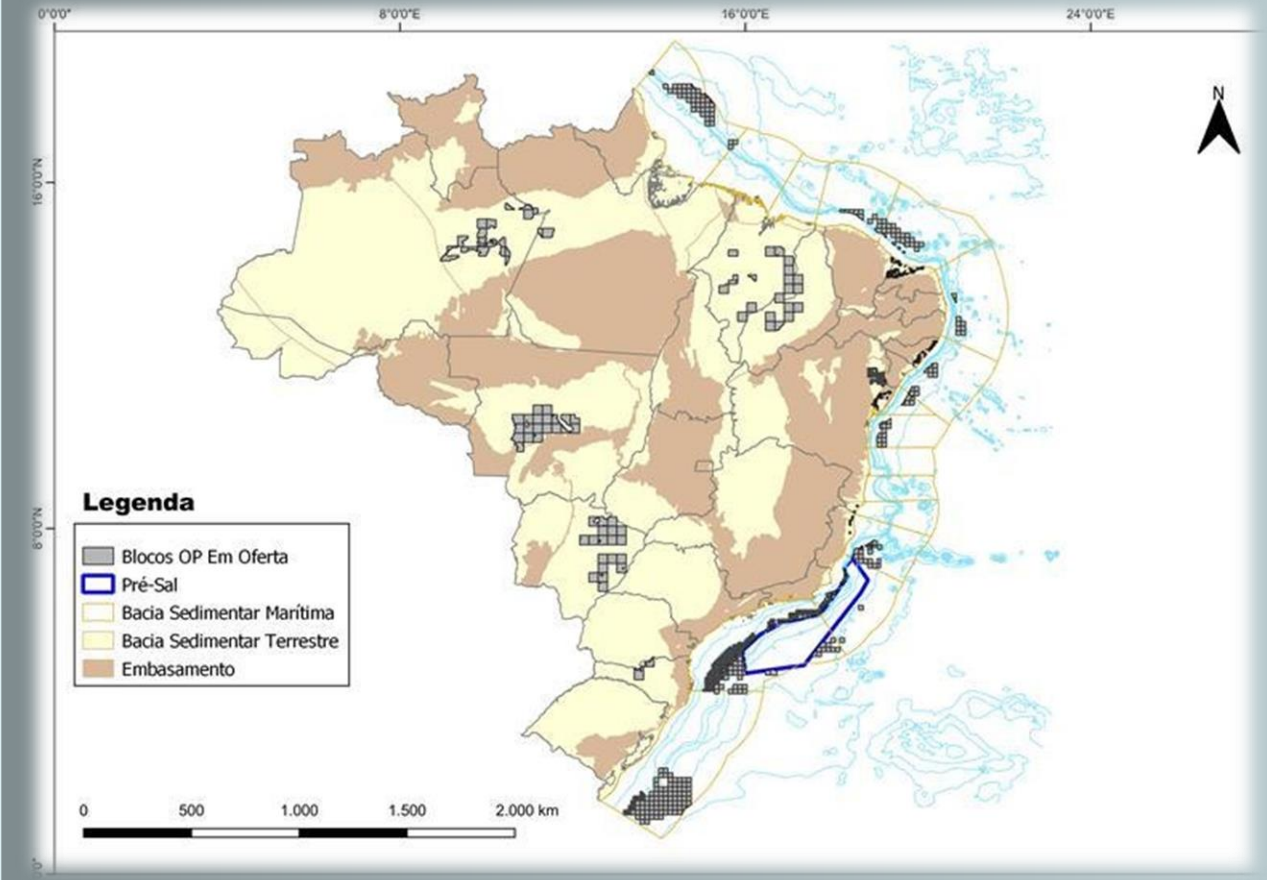
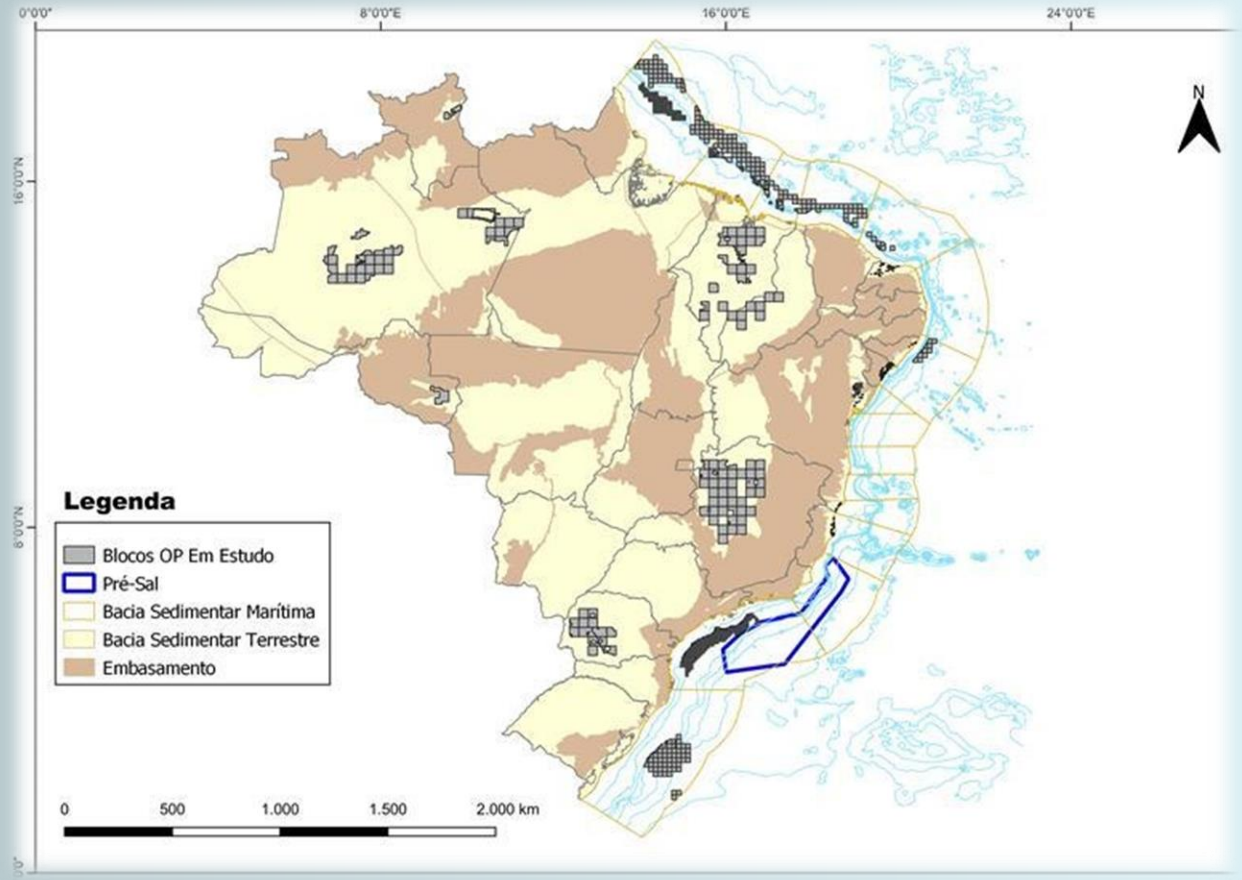
Open Acreage – Permanent Offer (OPC)

Less than 7% of Sedimentary Area

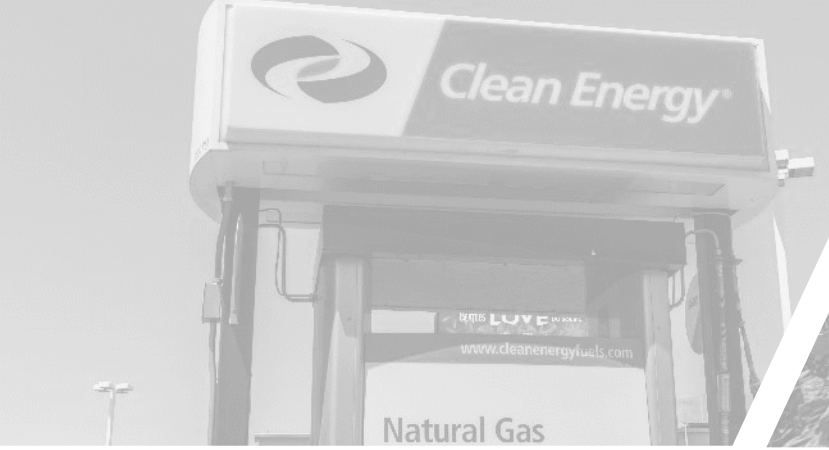




On Offer 2023 On Study

ANP RESOLUTION Nº 837/2021

ESTABLISHES THE PROCEDURE FOR NOMINATING AREAS TO BE STUDIED BY THE ANP



Brazil oil and gas play a crucial role in a vast supply chain, and Brazil's reserves are expanding. This industry has a significant impact on the country's financial and social development. Additionally, as Brazil's population continues to grow, so does the demand for energy, which is projected to increase.

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Final Remarks

Final Remarks

- Currently, Brazil's energy mix is undoubtedly one of the cleanest on a global scale;
- Currently, Brazil's numbers for clean energy are better than the global average it aims to achieve by 2050; and we are committed to continuing this trajectory towards a cleaner future;
- Fossil fuels will remain important in the energy mix worldwide, even during the transition to alternative sources;
- Brazil is committed to achieving net-zero emissions and has signed the Paris Agreement and reinforced its compromises recently;
- Brazil has been steadily growing its hydrocarbon production and spreading investments throughout the country, opening exploratory areas for fair competition;
- Brazil oil and gas play a crucial role in a vast supply chain, and Brazil's reserves are expanding. This industry has a significant impact on the country's financial and social development. Additionally, as Brazil's population continues to grow, so does the demand for energy, which is projected to increase.

It is important to note that Brazil currently has one of the cleanest energy mixes globally and is expected to become even cleaner by 2050.

AAPG Latin America & Caribbean Region

BRAZIL 2023

Geosciences Technology Workshop

Co-hosted by ABGP Associação Brasileira de Geólogos do Petróleo

Thanks!