

Brazil: country of clean energy

Thiago Barral
Executive President | EPE

November 2021

MINISTÉRIO DE
MINAS E ENERGIA



Who we are





About EPE



Federal institution, part of the structure of the Ministry of Mines and Energy



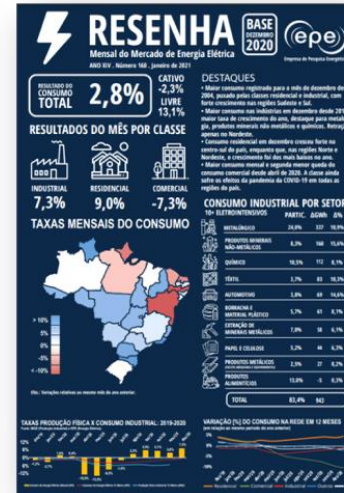
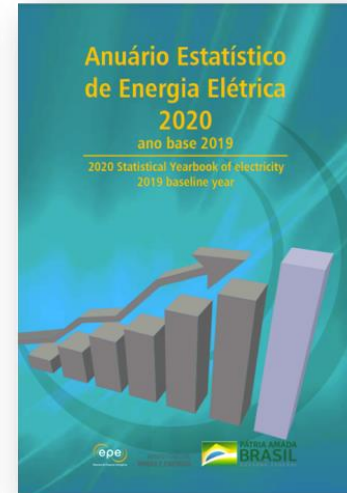
We develop energy planning studies and statistics to support formulation, implementation and assessment of the national energy policy



www.epe.gov.br

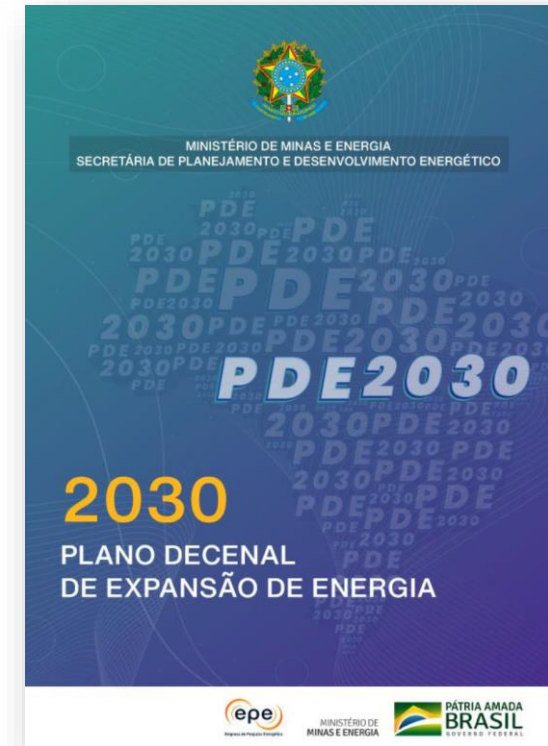
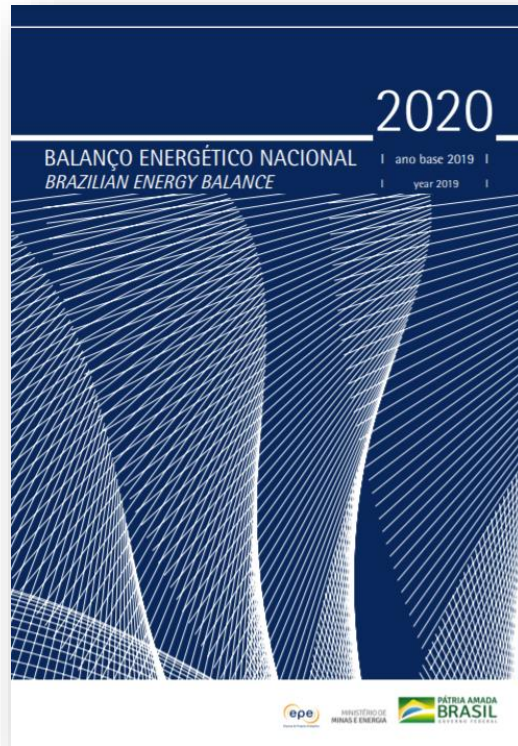
**Member of the National Council
for Energy Policy (CNPE)**

Portfolio of services, studies and publications



Integrated perspective of the energy sector, including oil, natural gas, biofuels, electricity, energy efficiency, environment...

Flagship publications



Following guidelines set by the Ministry of Mines and Energy

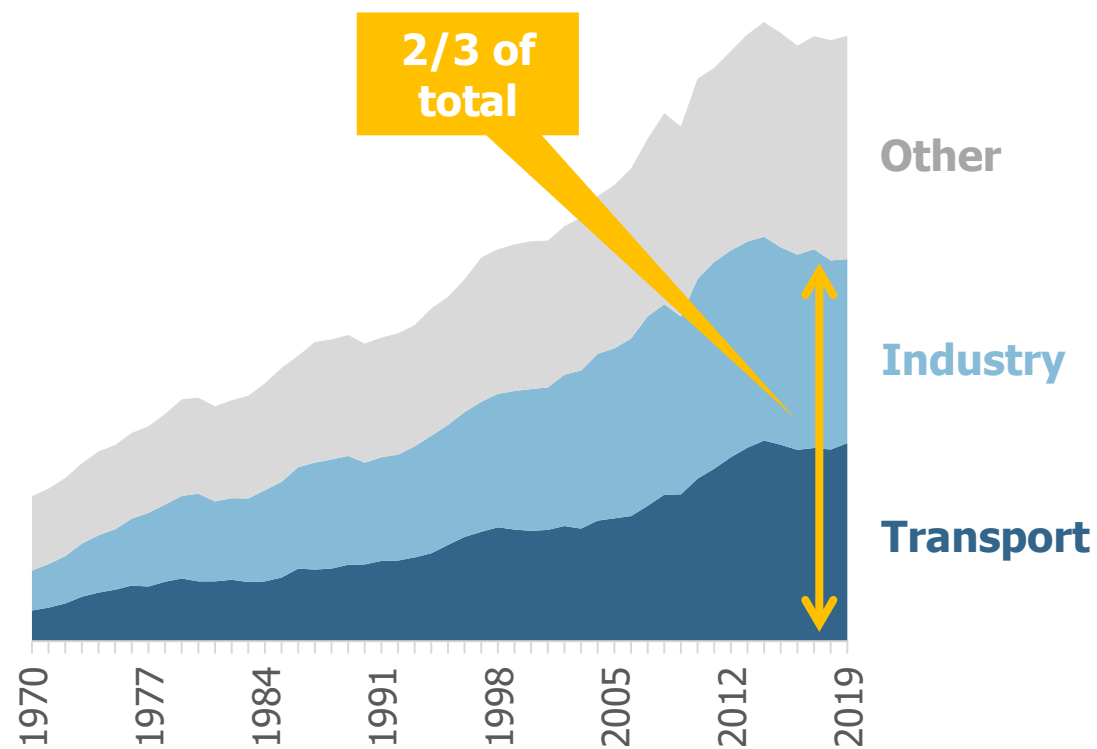
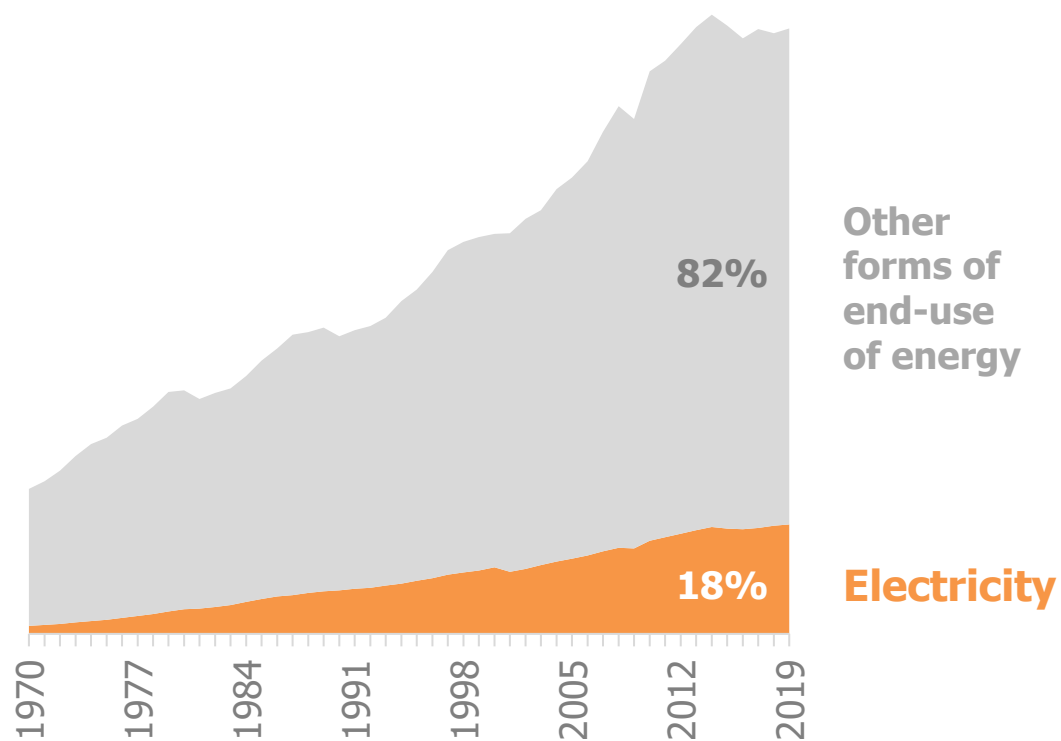
Overview of the energy sector in Brazil

A vertical white bar is positioned to the right of the main title text, extending from the top of the word 'energy' down to the top of the word 'Brazil'.

Energy, Electricity and Sectors

Final energy consumption

Brazil (1970-2019)



Source: EPE – National Energy Balance

Renewables are the hallmark of energy in Brazil

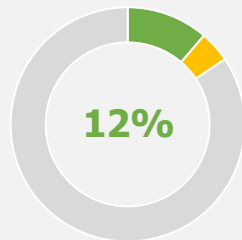
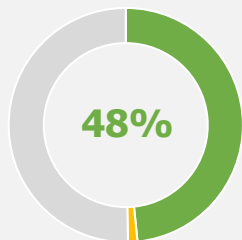


(2020)

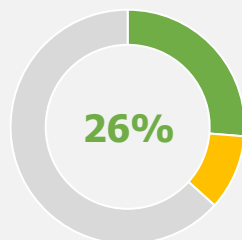
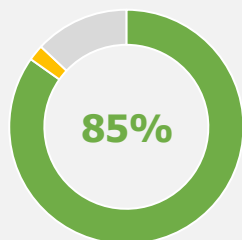


(2019)

Domestic energy supply



Domestic supply of electricity

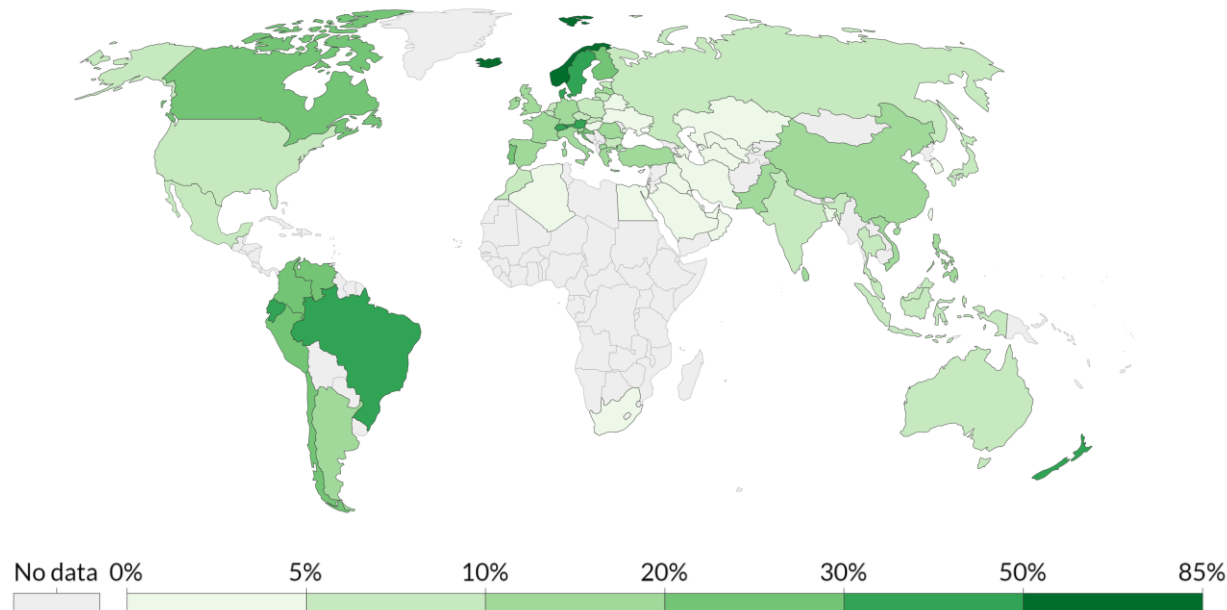


■ Renewables
 ■ Nuclear
 ■ Fossil

Share of primary energy from renewable sources

Renewable energy sources includes hydropower, solar, wind, geothermal, bioenergy, wave and tidal. It does not include traditional biofuels, which can be a key energy source especially in lower-income settings.

Our World in Data



Source: Our World in Data based on BP Statistical Review of World Energy (2020)

OurWorldInData.org/energy • CC BY

Note: Primary energy is calculated using the 'substitution method' which takes account of the inefficiencies energy production from fossil fuels.

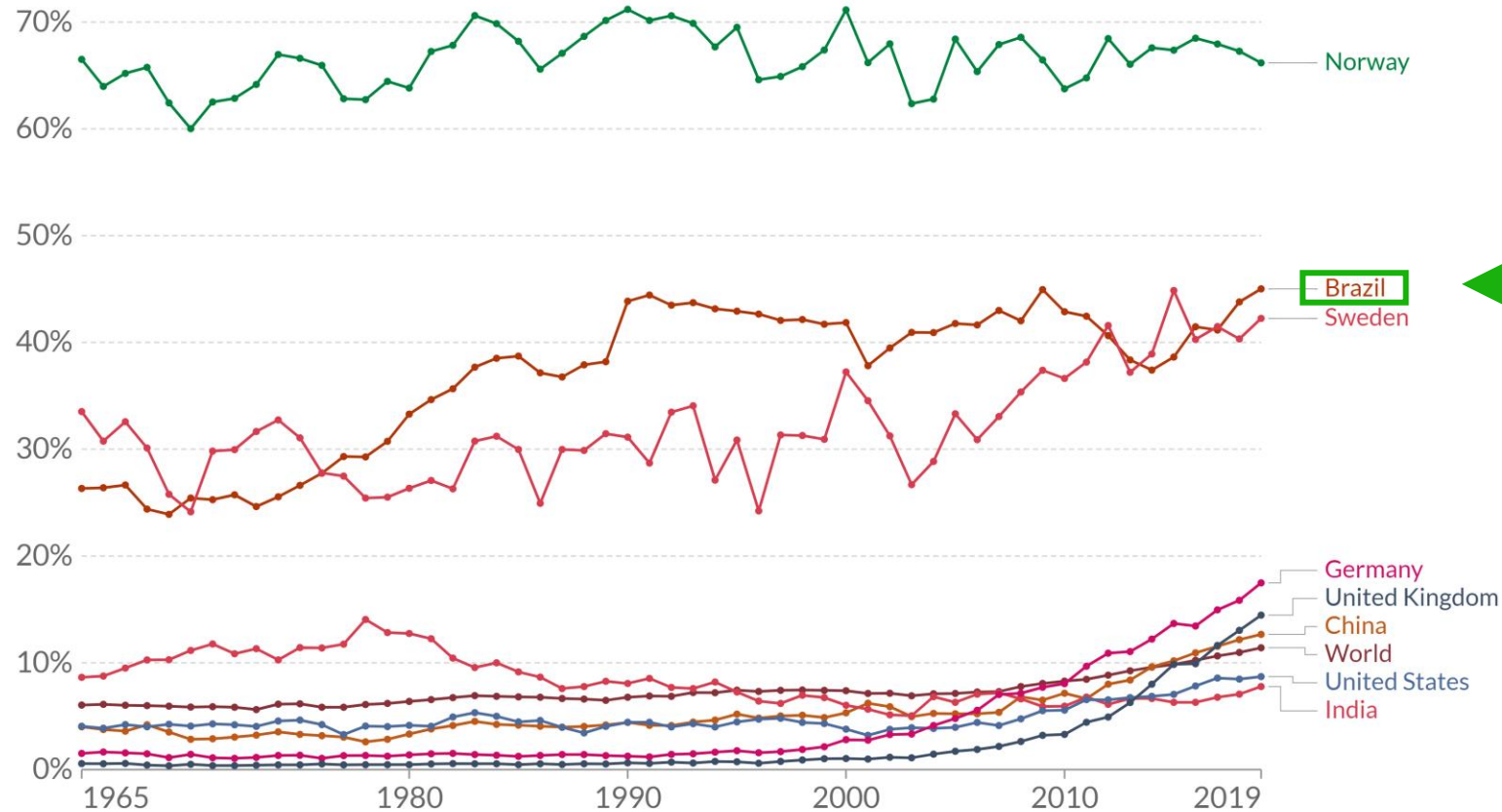
<https://ourworldindata.org/energy-mix>

Renewables are the hallmark of energy in Brazil

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Our World in Data



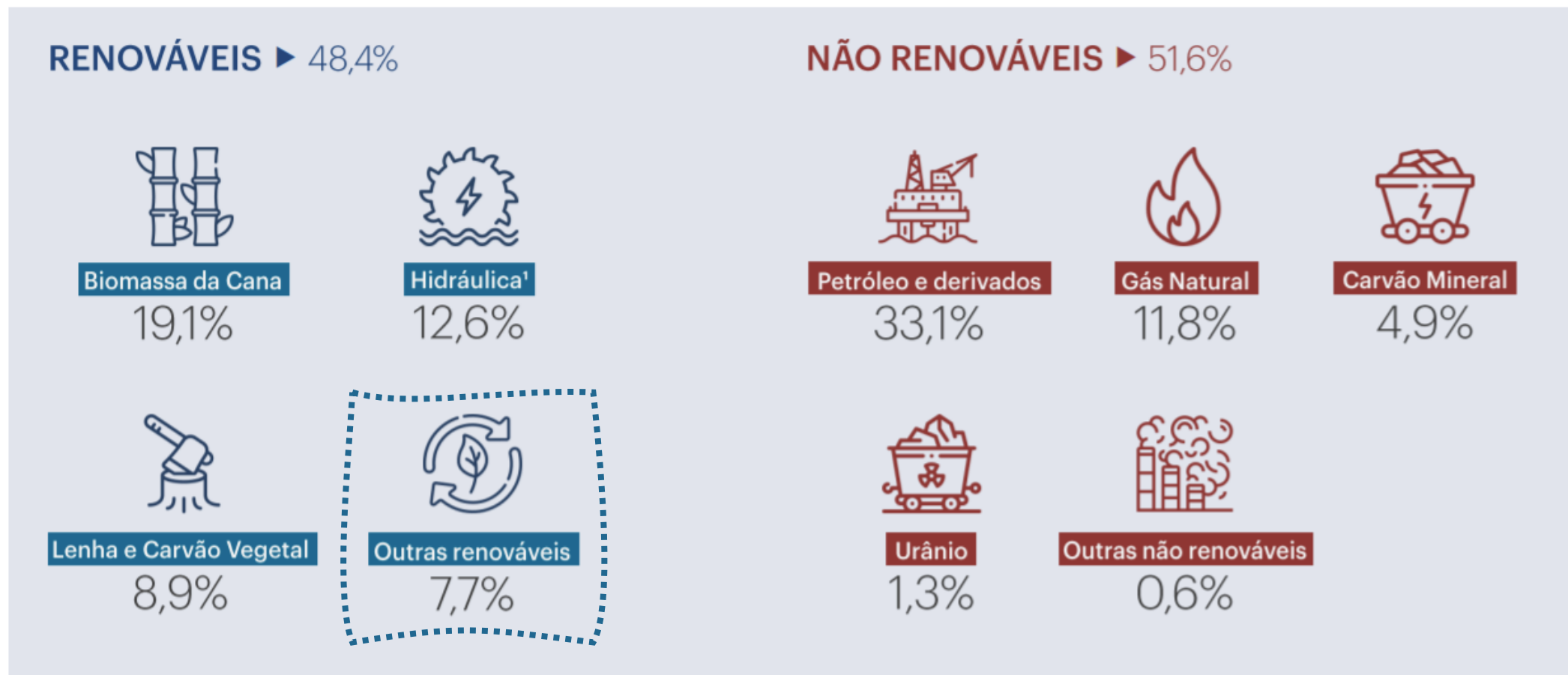
Brazil stands out among the great economies in terms of renewable energies

Source: Our World in Data based on BP Statistical Review of World Energy (2020)

OurWorldInData.org/energy • CC BY

Note: Primary energy is calculated using the 'substitution method' which takes account of the inefficiencies energy production from fossil fuels.

Domestic energy supply in Brazil (2020)

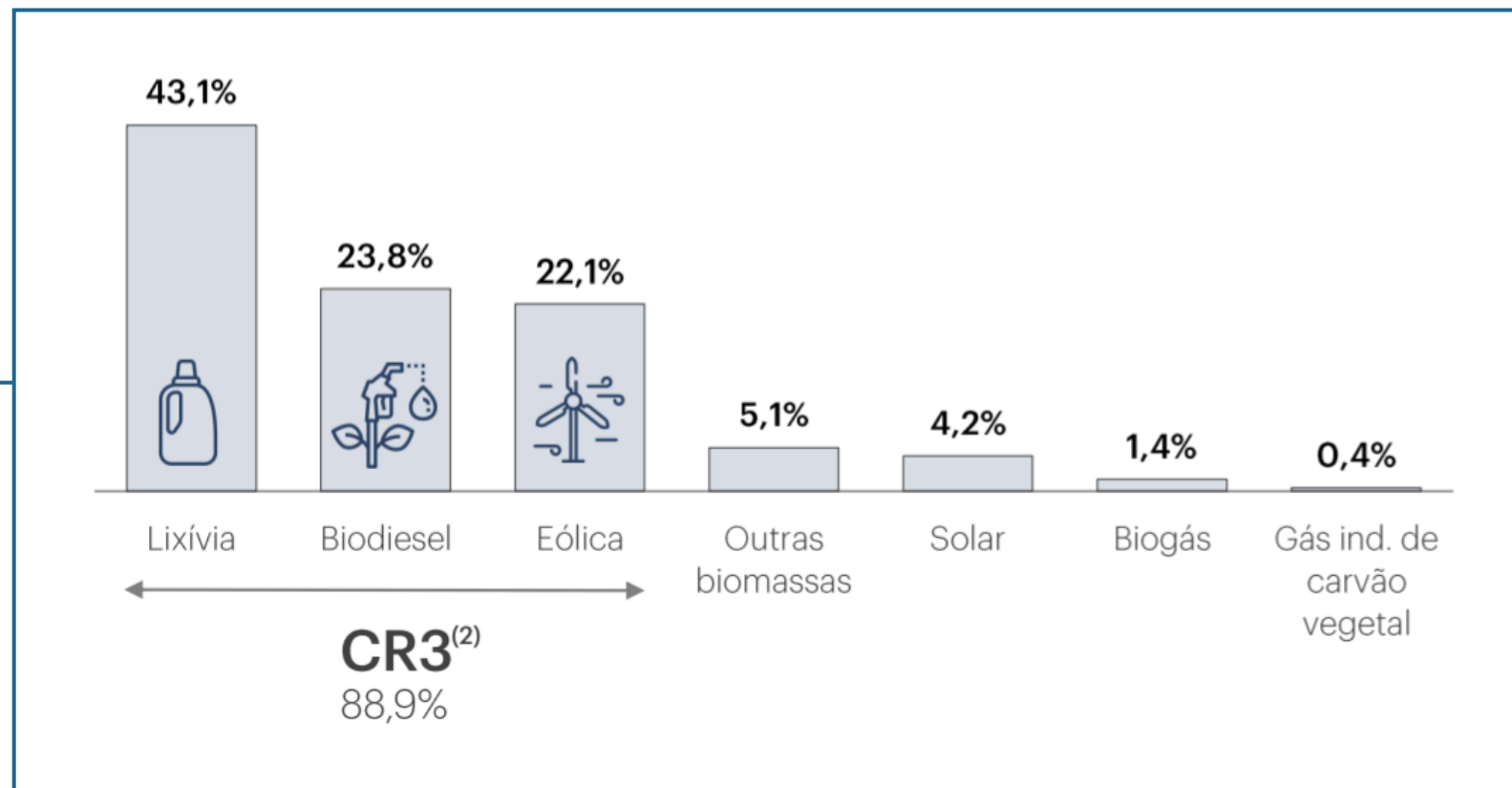


Source: Balanço Energético Nacional, EPE (2021)

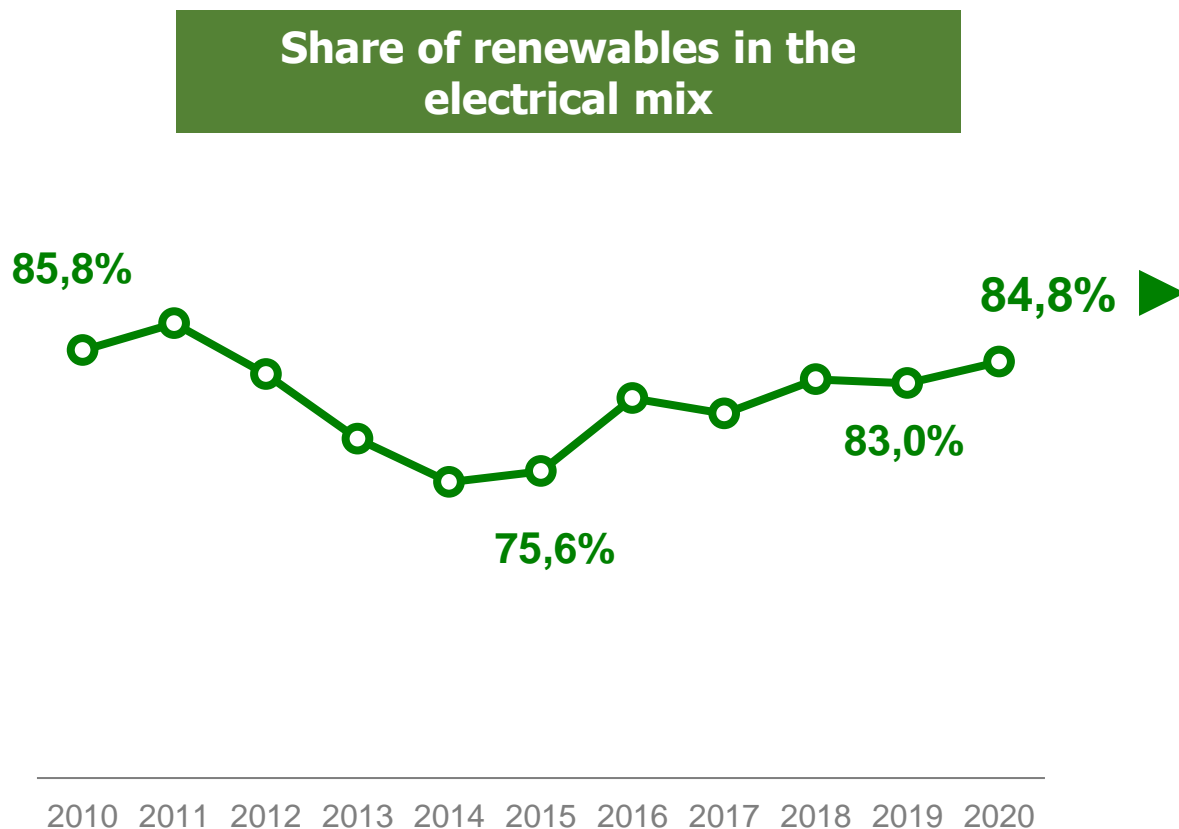
<https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/balanco-energetico-nacional-ben>

► With other renewable energies increasing their share...

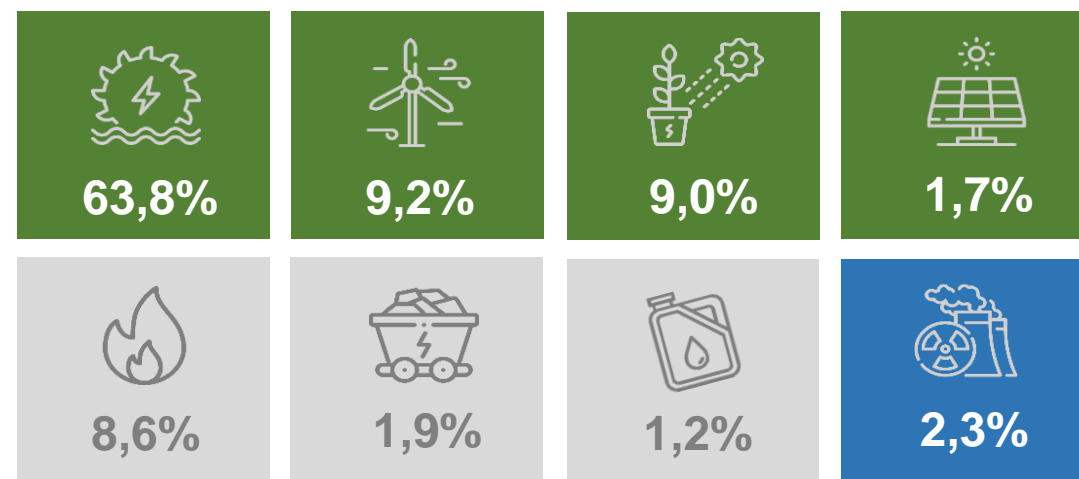
Domestic energy supply in Brazil (2020): Other renewables



► In the electricity sector, the mix develops like this:



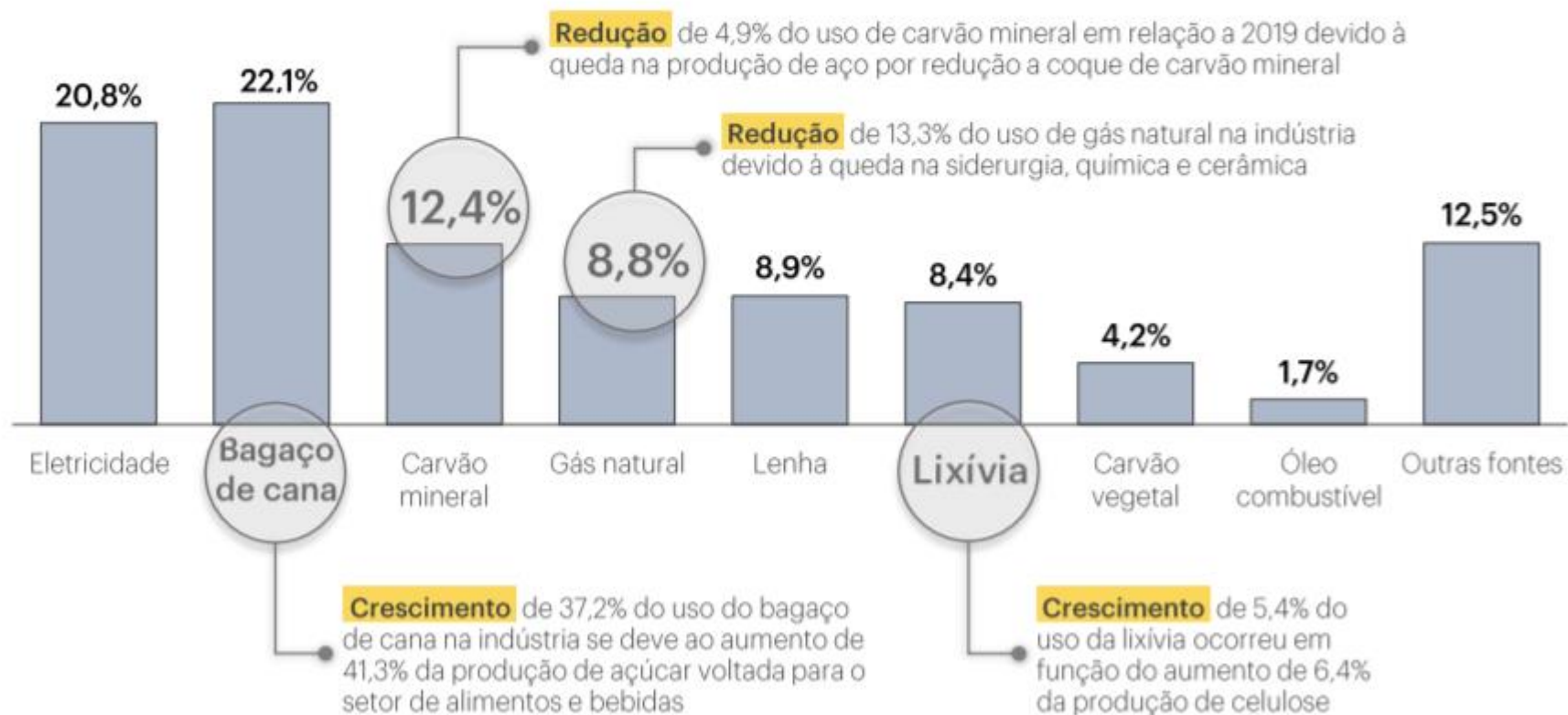
Electricity supply in 2020



Source: Balanço Energético Nacional, EPE (2021)
<https://www.epe.gov.br/pt/publicacoes-dados-abertos/publicacoes/balanco-energetico-nacional-ben>



Industrial energy consumption in 2020

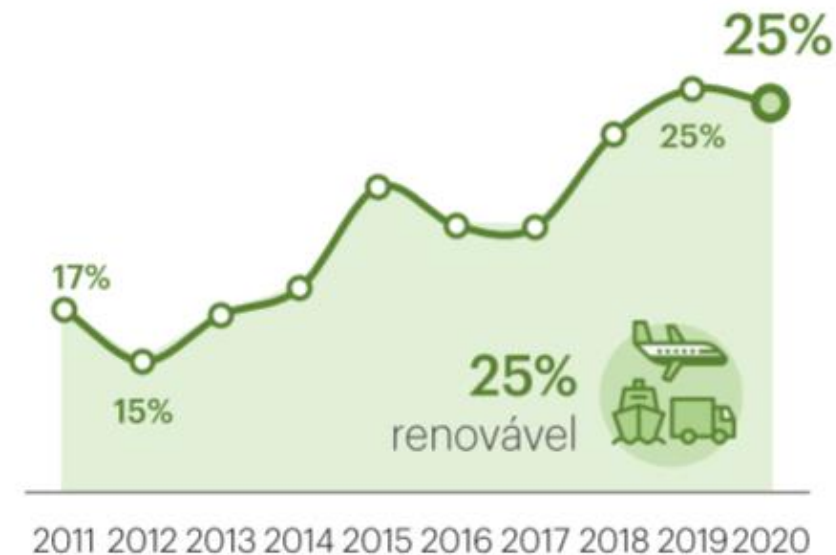
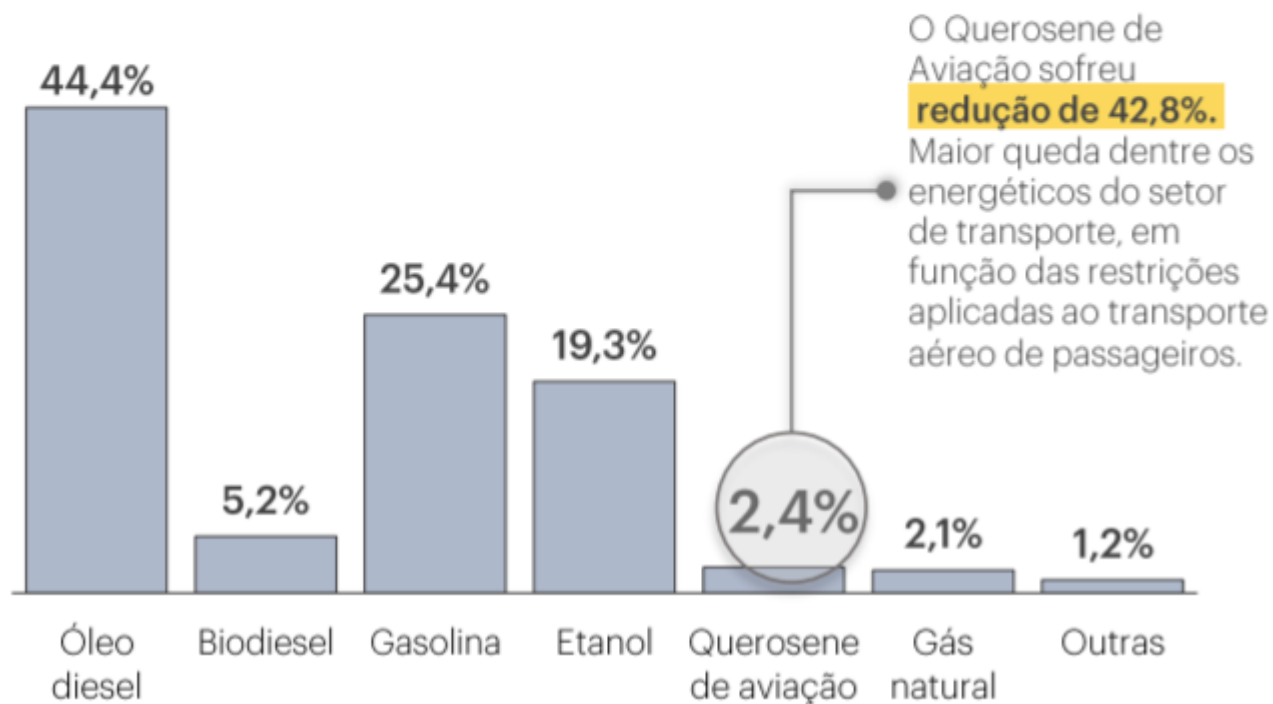


63%
renovável

*"Outras fontes" incluem óleo diesel, GLP, nafta, querosene, gás de coqueria, alcatrão, gás de refinaria, coque de petróleo, dentre outros renováveis e não renováveis.

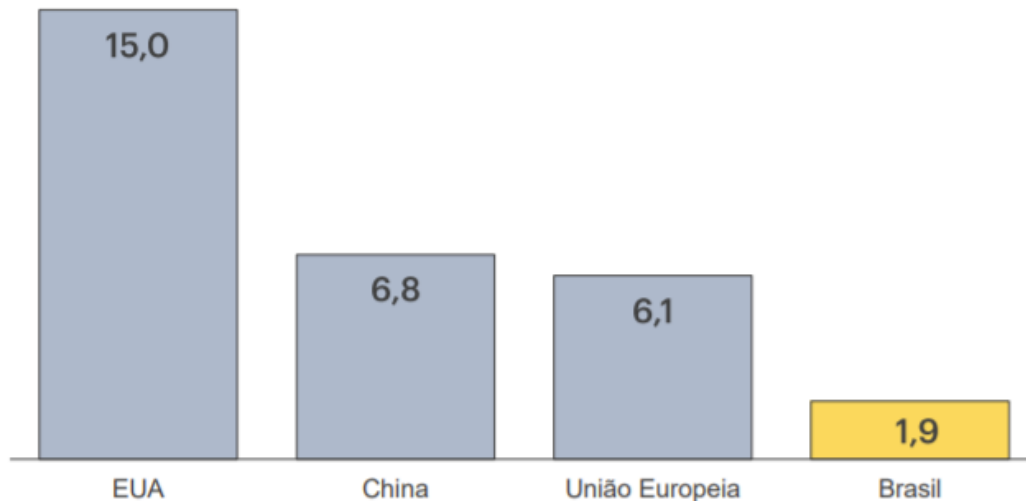


Energy consumption in transport in 2020



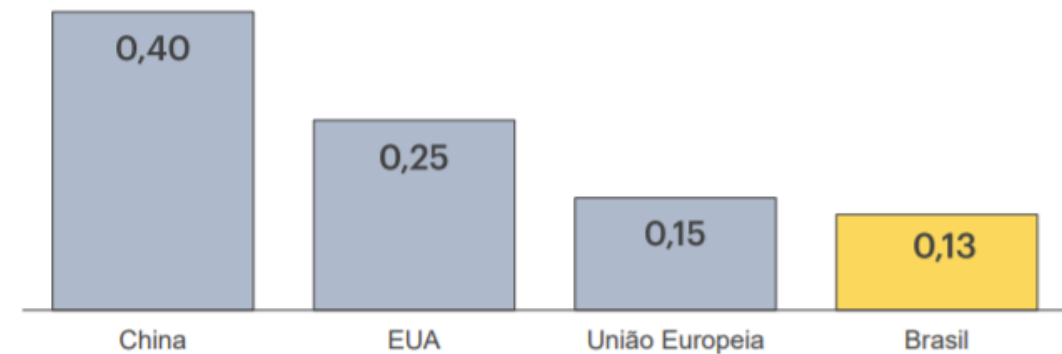
CO₂ emissions per capita

Emissões de CO₂ per capita (2018) em t CO₂/hab.
Fonte: Agência Internacional de Energia. Elaboração: EPE



Carbon intensity in the economy

Intensidade de carbono (2018) em kg CO₂/US\$_{ppp} [2010]
Fonte: Agência Internacional de Energia. Elaboração: EPE

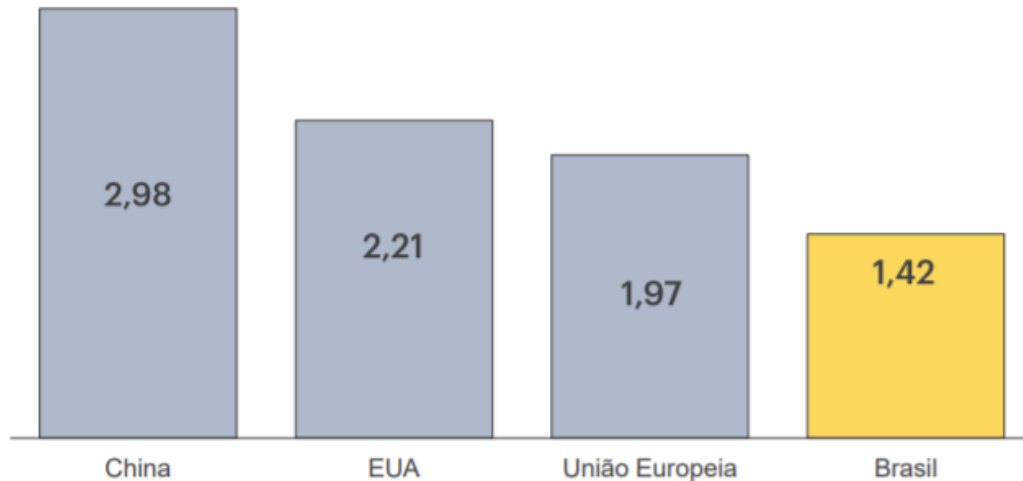


On average, **each Brazilian emits 1/7 of what an American emits and 1/3 of what a European or a Chinese emits** in energy production and consumption.

Emissions per Domestic Energy Supply unit

Emissões de CO₂ (t) por tep (2018)

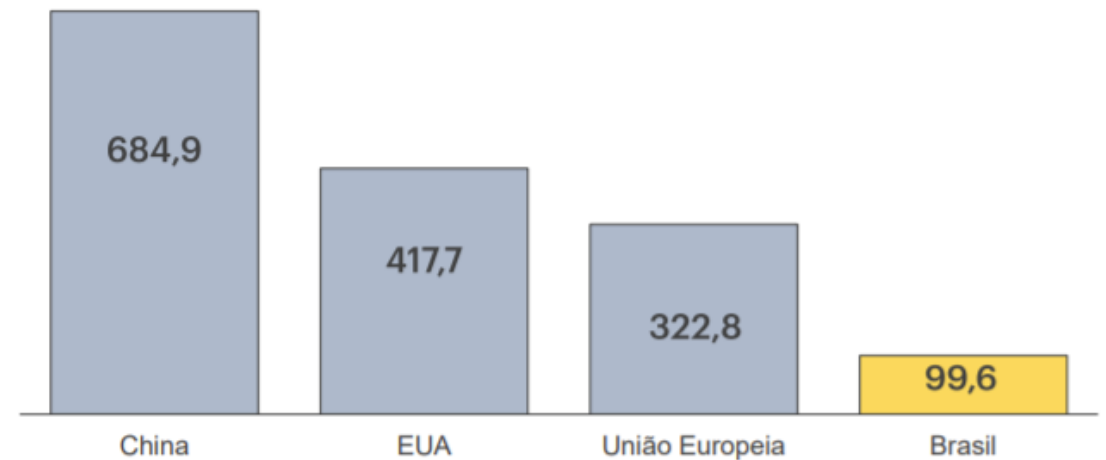
Fonte: Agência Internacional de Energia. Elaboração: EPE



Emissions in electricity generation

Emissões de CO₂ (kg) por MWh gerado (2018)

Fonte: Agência Internacional de Energia. Elaboração: EPE

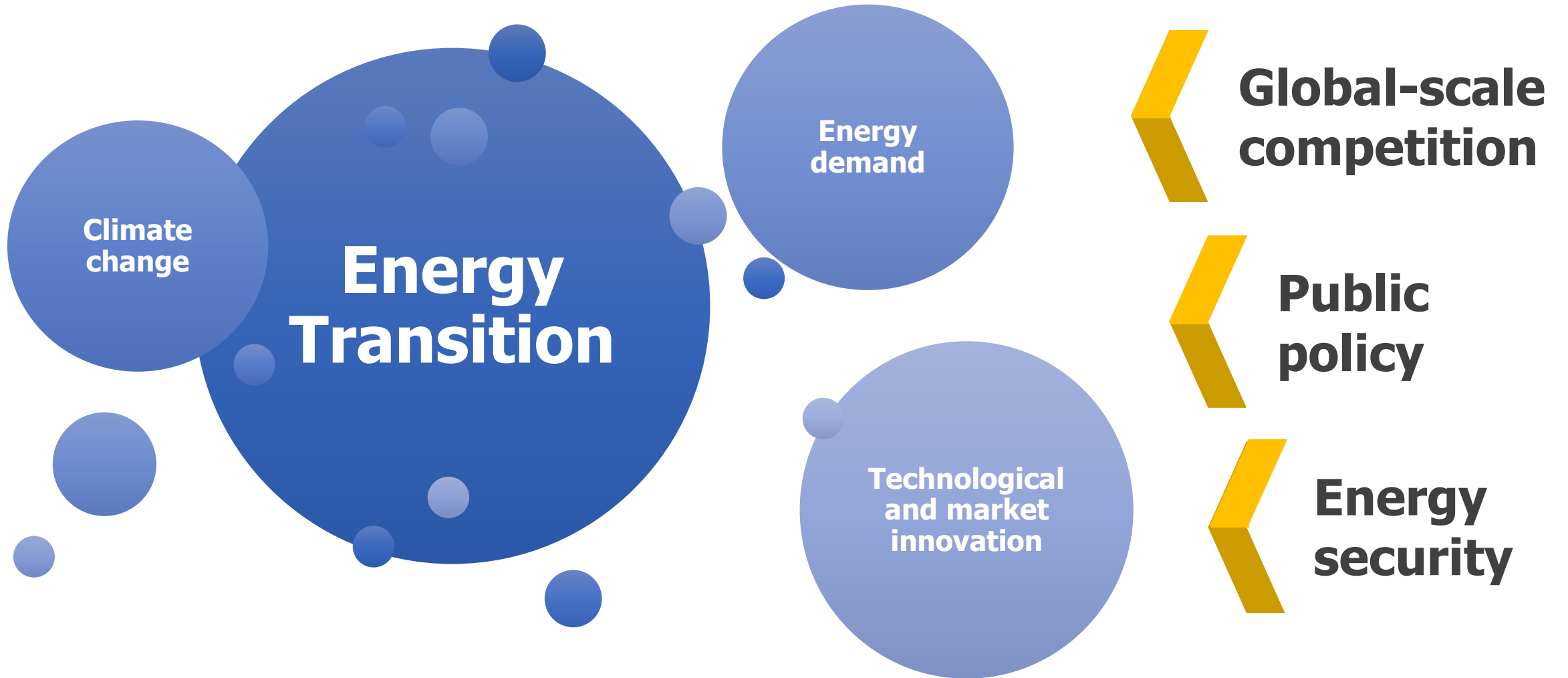


For every ton oil equivalent (toe) made available, Brazil emits the equivalent of **72% of what the European Union emits, 46% of what the United States emits and 47% of what China emits.**

**Renewable,
yet in transition**



Forces driving the energy transition



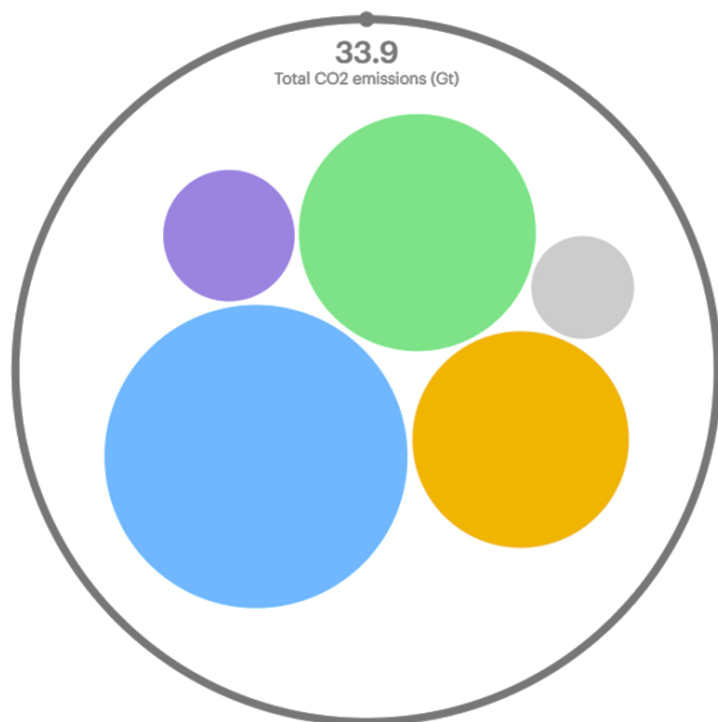
From ambition to action, and to effective results...



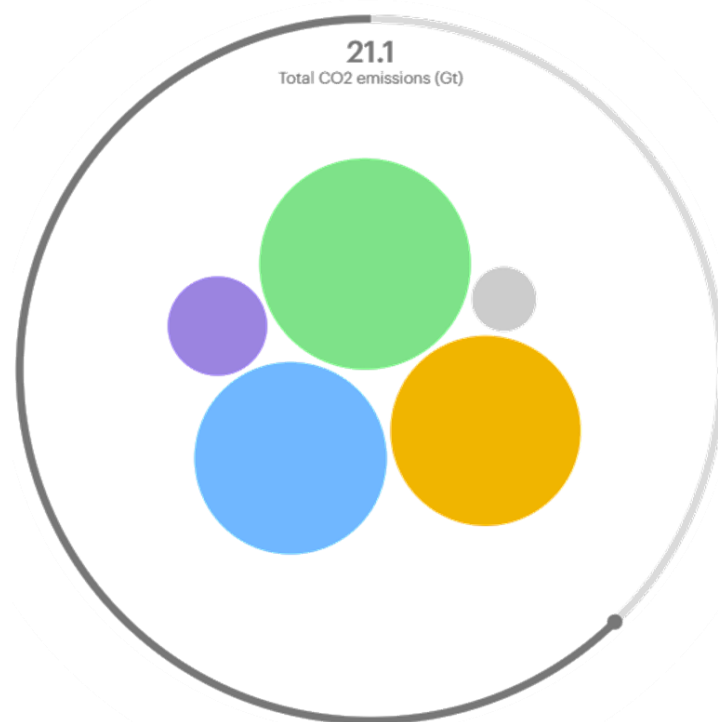
Decarbonization scenarios help establish a consistent and credible set of public policies and society's efforts

The scale of the challenge is global...

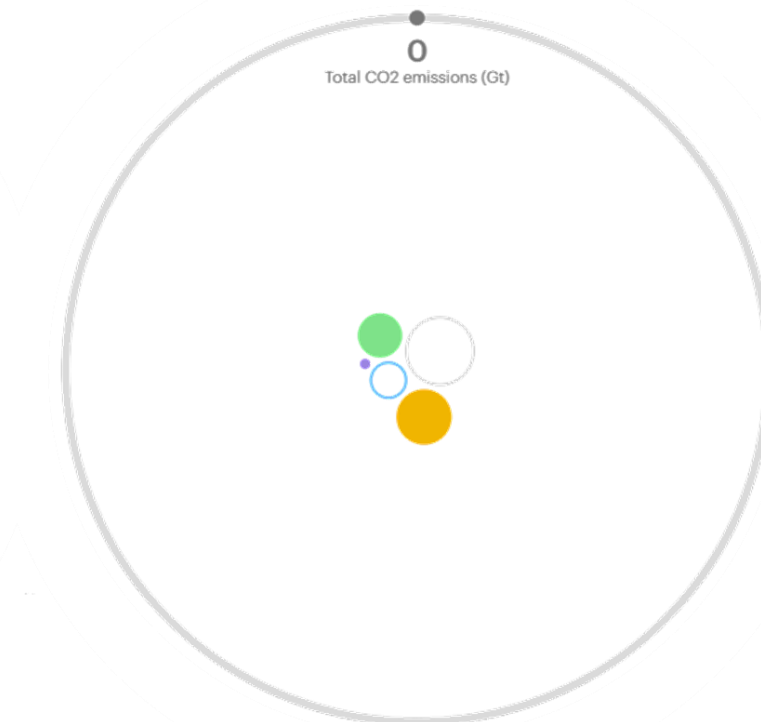
2020



2030



2050



● Edificações

● Indústria

● Outros

● Eletricidade e calor

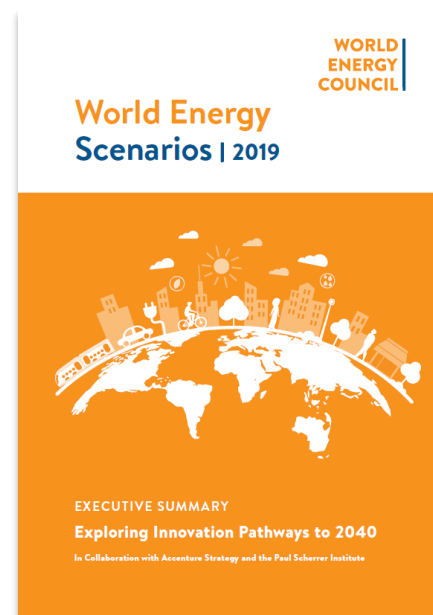
● Transportes

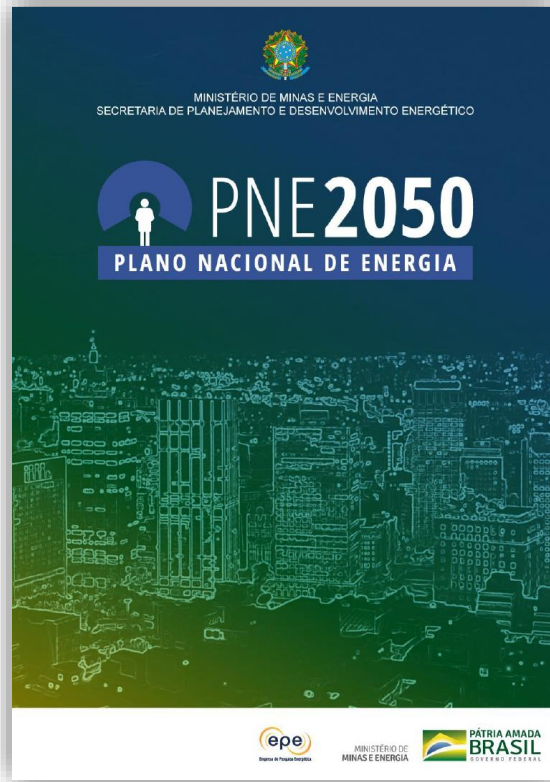
○ Emissões negativas

Fonte: Agência
Internacional de
Energia (IEA)

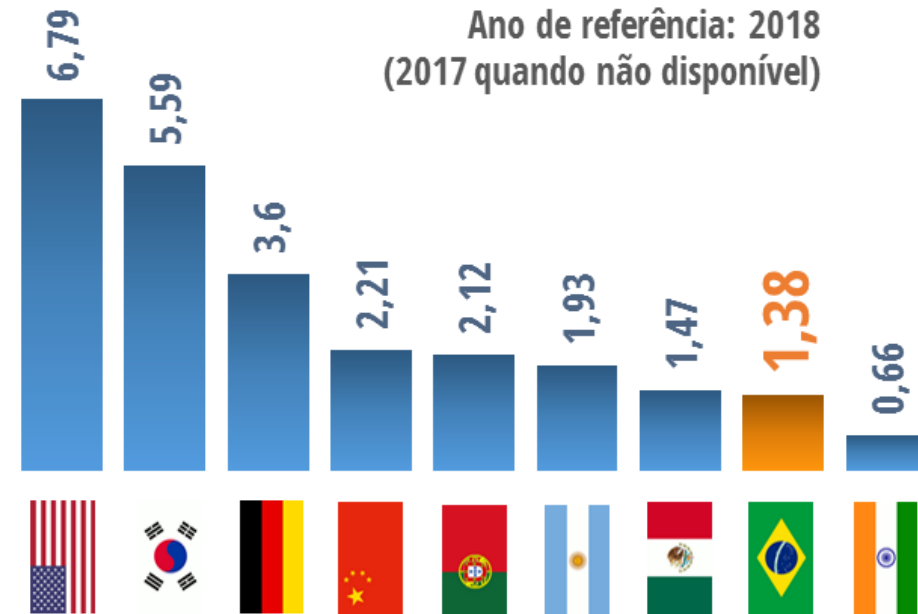
Examples of energy scenarios...

- **Global scenarios** to give a broad perspective of challenges and opportunities
- **National and regional scenarios** for better adaptation strategy and international integration in value chains





Energy supply per capita



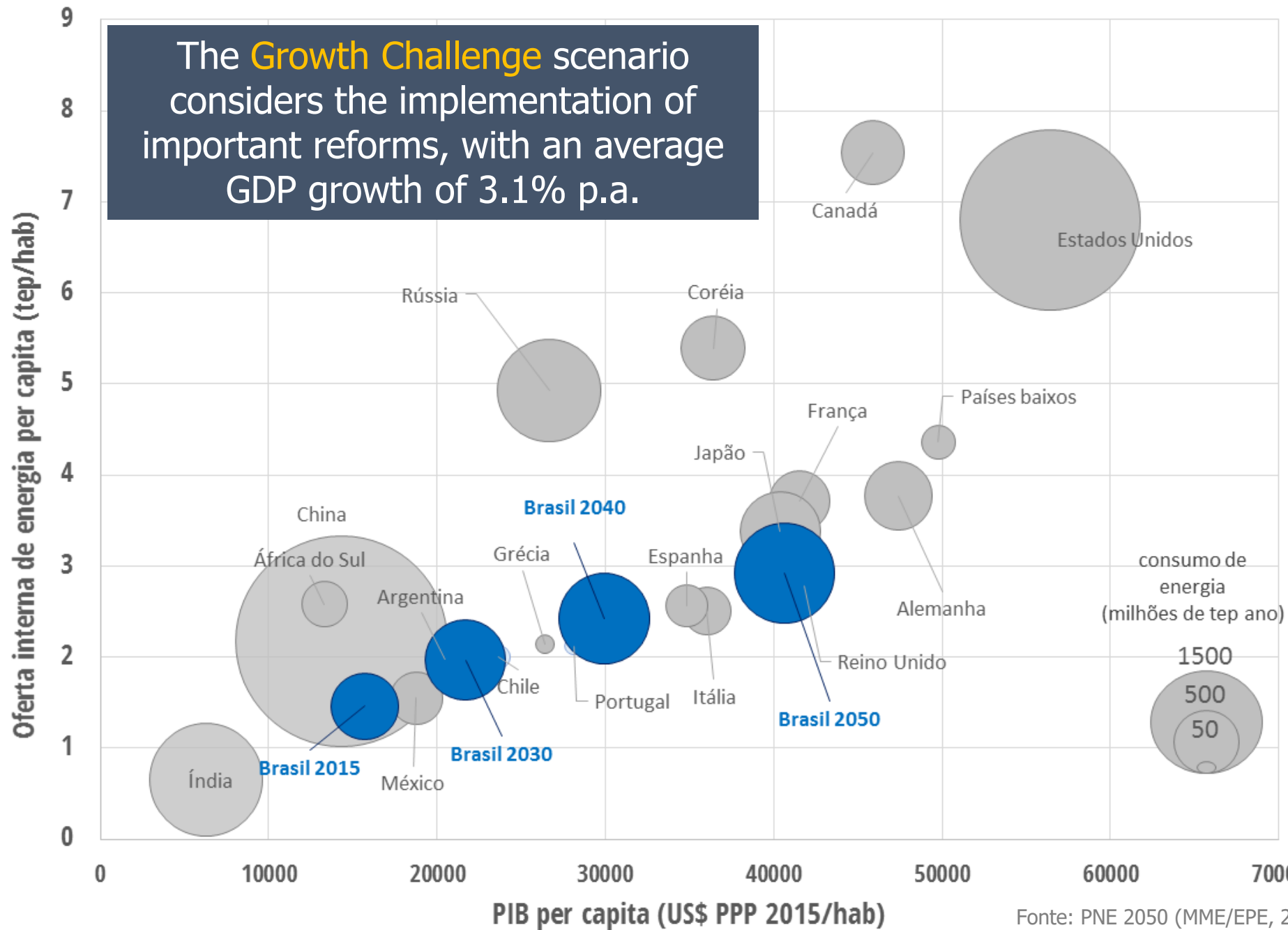
Fonte: Agência Internacional de Energia

The country's development requirements lead to increased energy demand, even with efficiency gains



2.2x energy demand (2050/2015)
3.3x electricity demand (2050/2015)

The **Growth Challenge** scenario considers the implementation of important reforms, with an average GDP growth of 3.1% p.a.

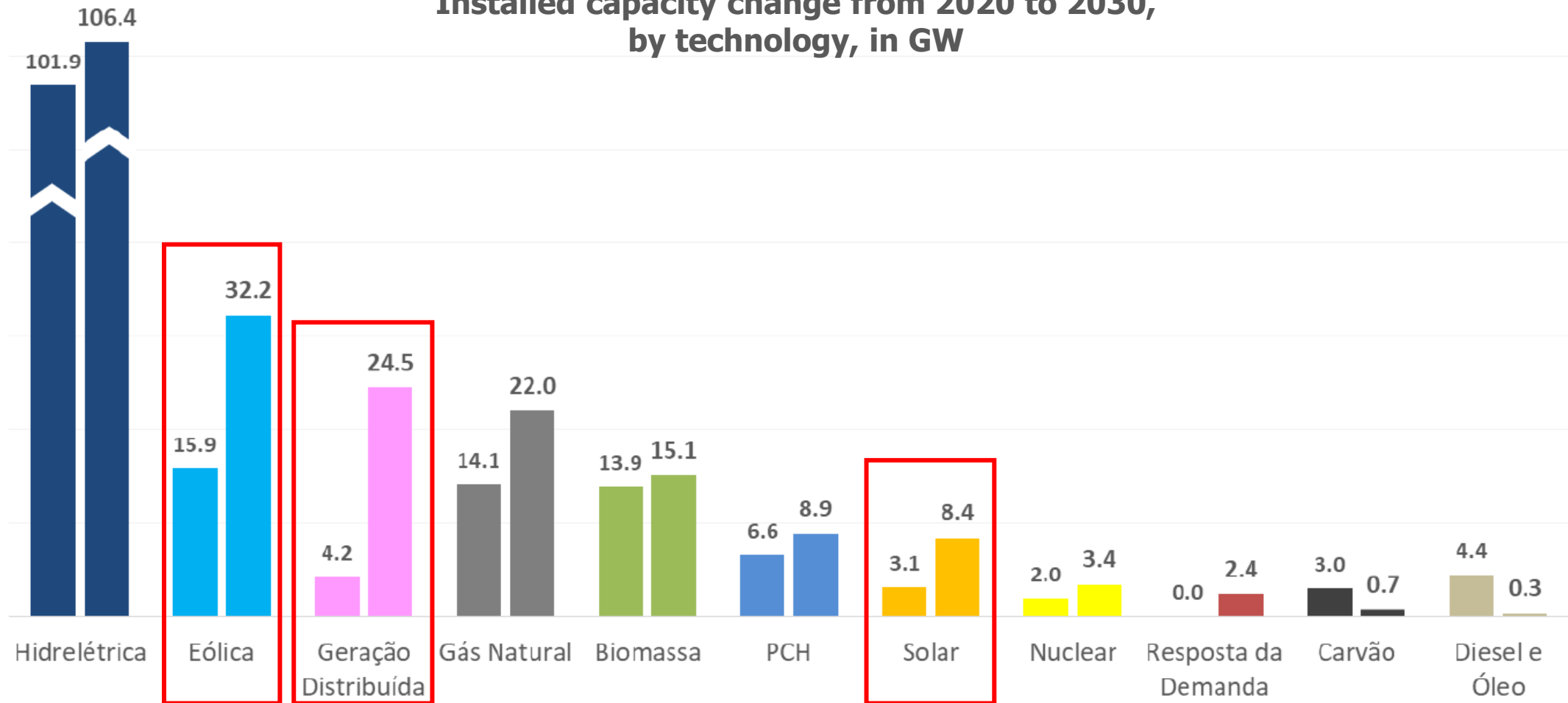


Fonte: PNE 2050 (MME/EPE, 2020)

PDE 2030 | Additional power generation installed capacity



Installed capacity change from 2020 to 2030,
by technology, in GW



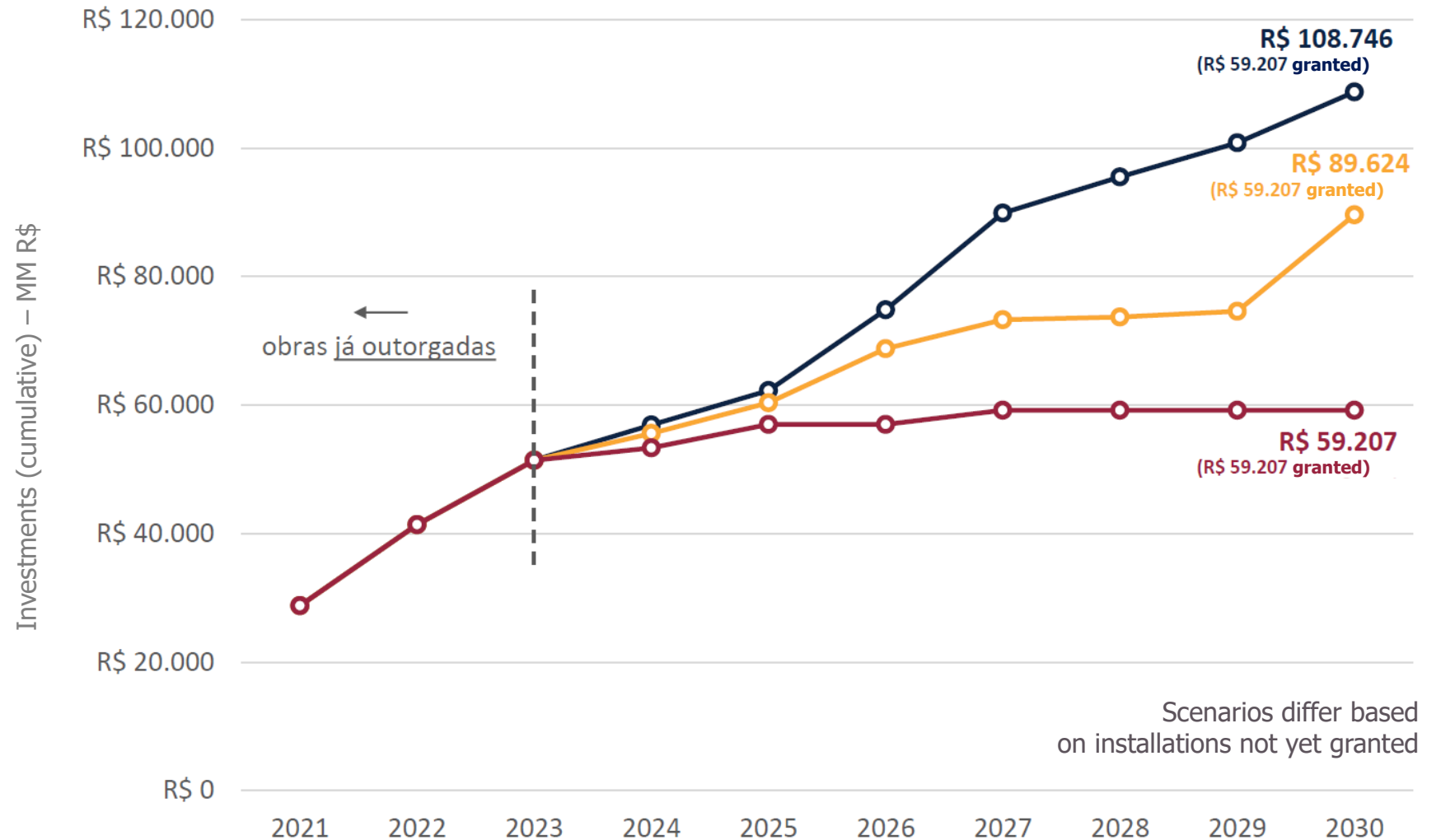
* Reference scenario

PDE 2030 | Transmission is also key

- Higher Scenario
- Reference Scenario
- Lower Scenario

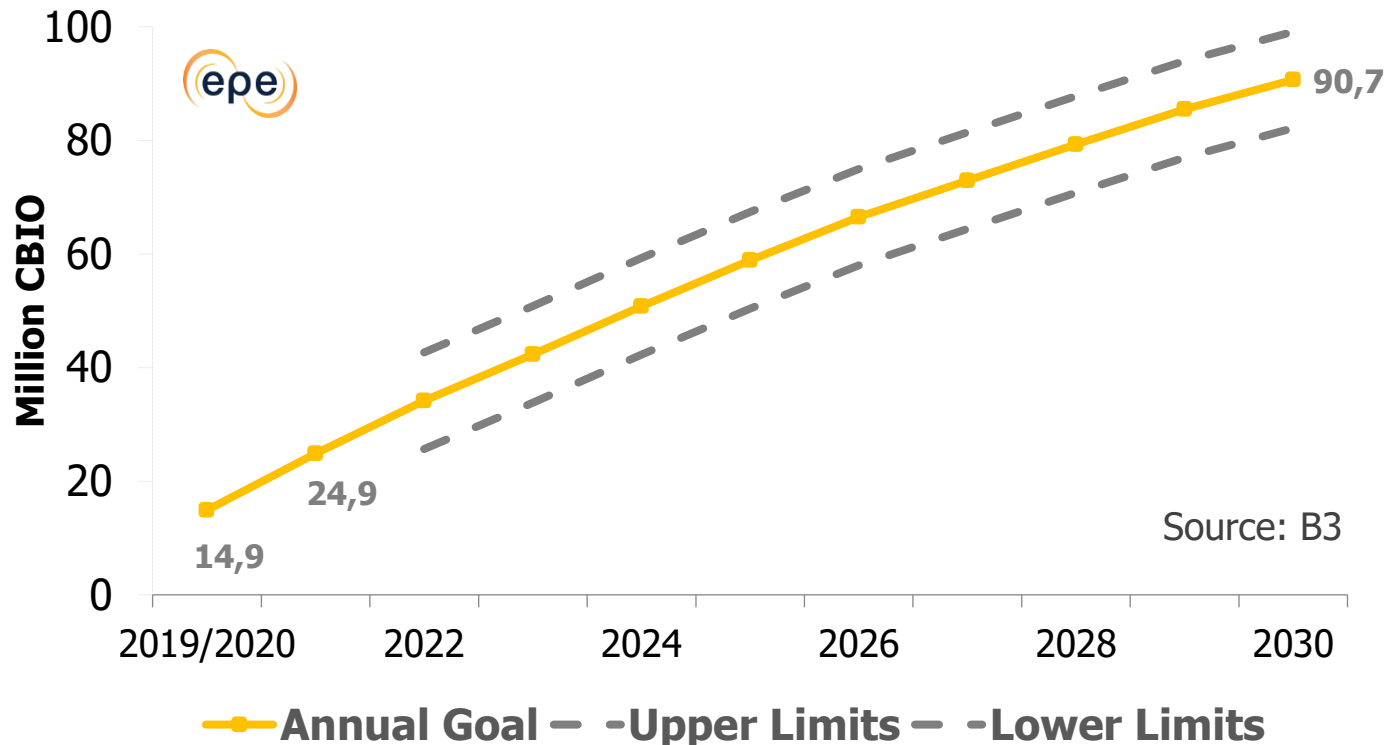


Ref.: BPR ANEEL, June 2020





Annual carbon intensity reduction targets (gCO₂/MJ) expressed in CBIO purchase obligation



Annual targets broken down into individual goals for fuel distributors



Biofuels Certification

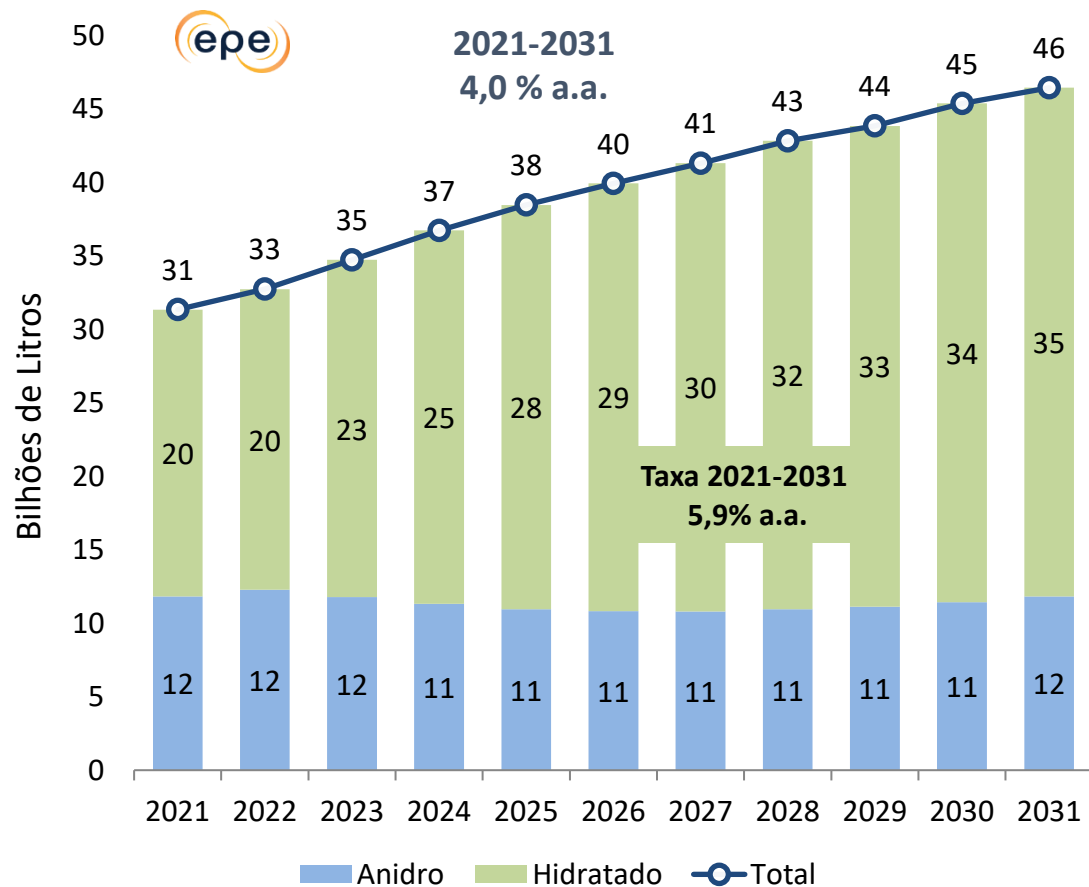
- Biofuel production is certified by inspector firms, considering sustainability criteria



Decarbonization Credits (CBIO)

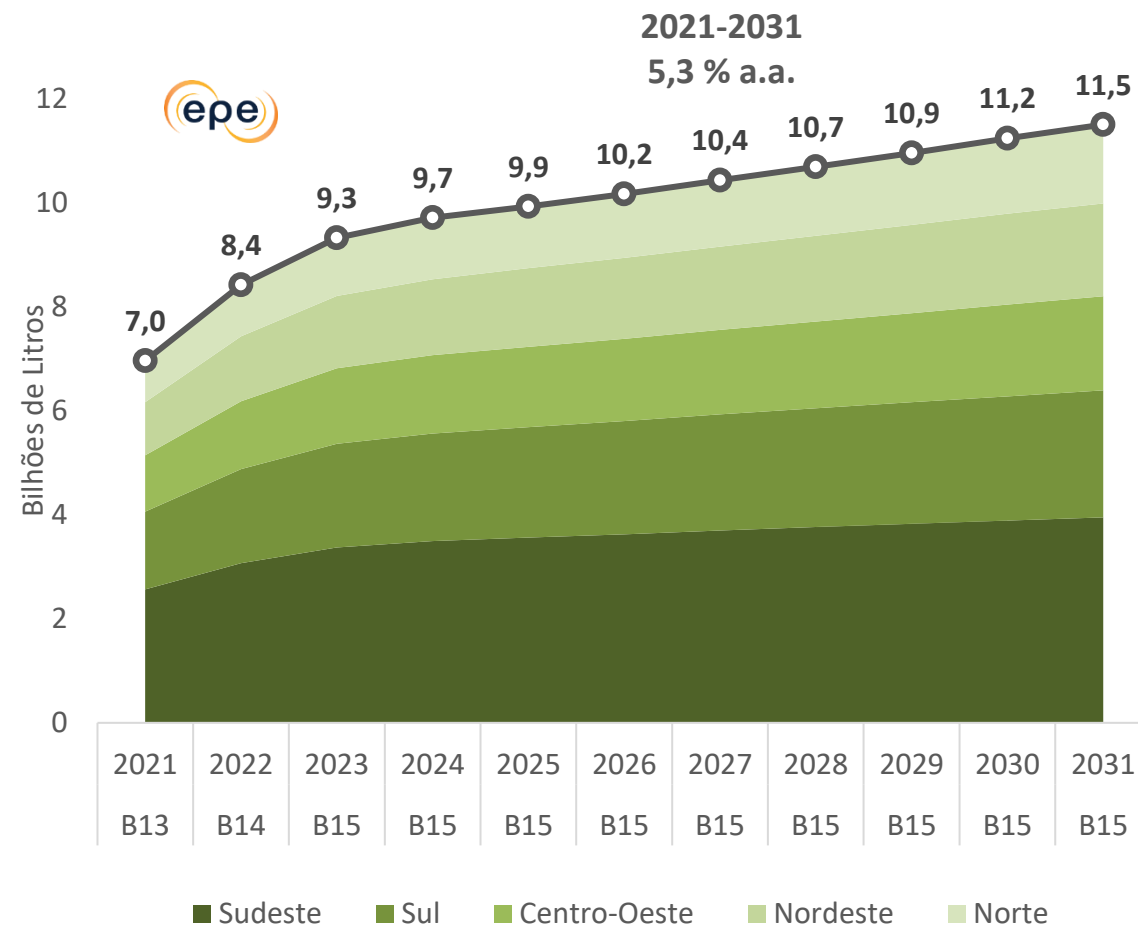
- CBIO is the result of the energy-environmental efficiency score multiplied by the production unit certified capacity and the volume of biofuel sold to distributors
- 1 CBIO = 1 ton CO₂eq reduced

Ethanol demand



Fonte: Elaboração própria

Biodiesel demand



Nota: Possibilidades para o éster e o parafínico

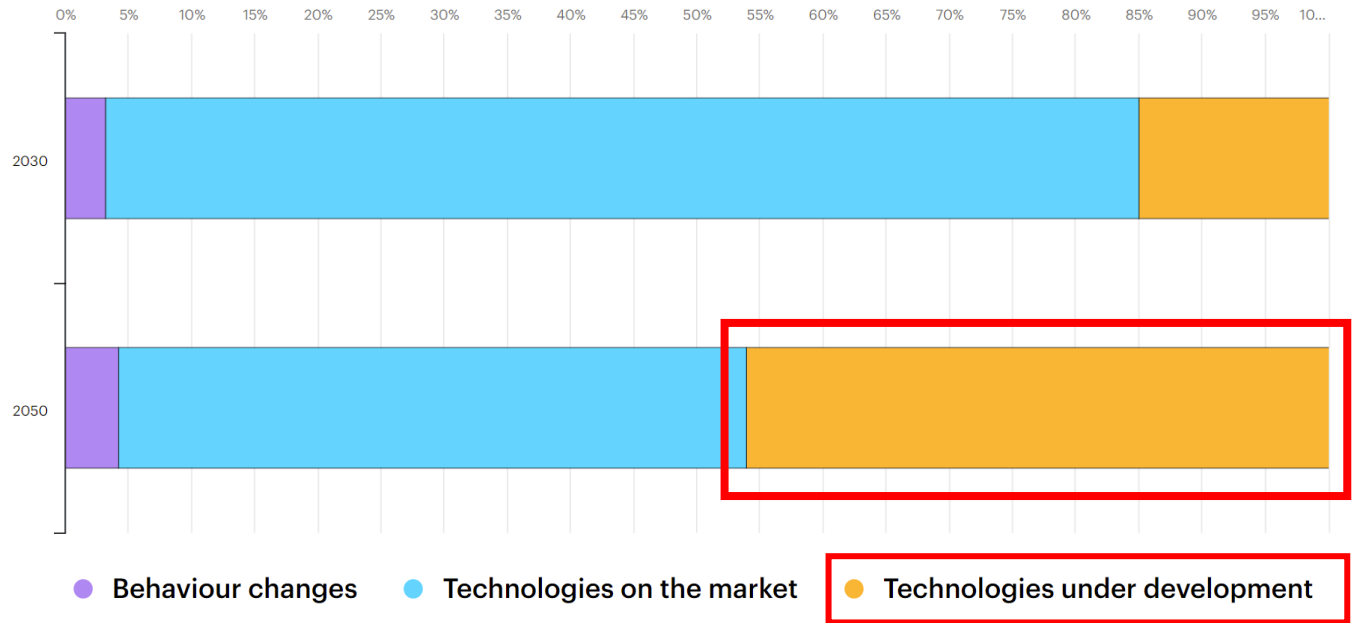
Fonte: Elaboração própria

But clean electricity and electrification alone won't be enough...



IEA NZ 2050

Annual CO2 emissions savings in the net zero pathway, 2030 and 2050, relative to 2020



Decarbonization scenarios identify the need to develop advanced biofuels, low carbon hydrogen, carbon capture, modular nuclear reactors, digitization, etc.

Accelerating the formulation of new policies...



Technical Committee – Combustível do Futuro (CT-CF)

Ciclo Otto

Novo combustível com alta octanagem e baixo carbono

Condições técnicas e econômicas para etanol 2G em larga escala

Desenvolvimento de célula a combustível (etanol, biometano e GN)

Ciclo Diesel

Corredores verdes com abastecimento a biometano, GN e GNL

Combustíveis sustentáveis e baixo carbono no ciclo diesel

ProBioCCS

Arcabouço legal e regulatório para captura e armazenagem de CO₂

ProBioQAV

Introdução de querosenes de aviação sustentáveis

Política integrada para produção de BioQAV, HVO e nafta verde

Combustíveis Marítimos

Condições para adição de biocombustíveis a combustíveis marítimos

PD&I

Diretrizes e condições para PD&I em combustíveis renováveis

National Hydrogen Program

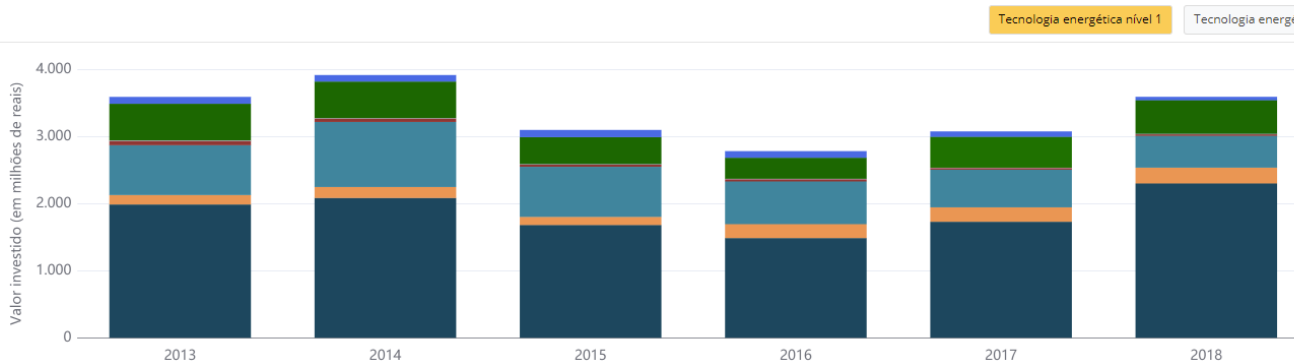
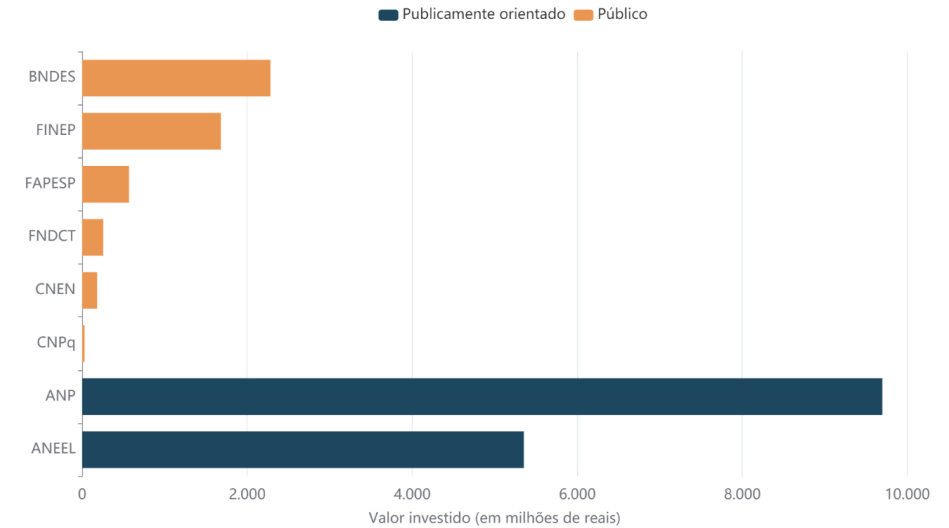


R&D and Innovation as key factors

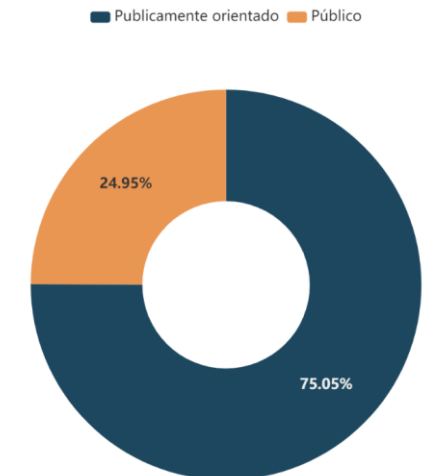


inova e BRASIL Panorama dos investimentos de inovação em energia no Brasil

<p>PROPOSTA</p> <p>É uma plataforma digital projetada para tornar acessíveis, aos mais diversos públicos, os dados de investimentos brasileiros em Pesquisa, Desenvolvimento e Demonstração (PD&D) em energia.</p>	<p>OBJETIVO</p> <p>Aprofundar a compreensão das tendências de investimento em PD&D em energia e apoiar na formulação e promoção de políticas públicas, pesquisas e novos investimentos na área de inovação em energia.</p>	<p>COOPERAÇÃO</p> <p>EPE, MME, MCTI, bem como outras organizações do governo brasileiro, do setor privado e da sociedade civil.</p>	<p>FUNCIONAMENTO</p> <p>As informações estratégicas disponibilizadas na inova-e foram organizadas em uma única base de dados fornecendo um panorama inédito dos esforços em inovação no setor energético no Brasil.</p>
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- Combustíveis fósseis: petróleo, gás natural e carvão mineral
- Eficiência energética
- Energias renováveis
- Fissão e fusão nuclear
- Hidrogênio e células a combustível
- Outras tecnologias de energia e armazenamento
- Outras tecnologias transversais



UN High Level Dialogue on Energy



Brazil presented voluntary commitments in the **UN High Level Dialogue on Energy** in 2021



HIGH-LEVEL DIALOGUE ON
ENERGY



Vídeos de lançamento:

<https://youtu.be/8vSCKBw2YCM>

<https://youtu.be/y9SIaNGI344>



Thank you!



Empresa de Pesquisa Energética

MINISTÉRIO DE
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