How is Petrobras adapting to the energy transition

Climate change management and leadership in energy transition

Argus Rio Crude Conference

Mauricio Tolmasquim

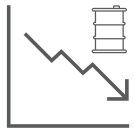
May, 2023

WHY IS PETROBRAS DECARBONIZING?

PETROBRAS

Why is Petrobras decarbonizing?

Governments are setting ambitious decarbonization goals



Oil demand is forecasted to retract

Renewable sources of energy are becoming more competitive

Transport, the key market for oil will be severely affected

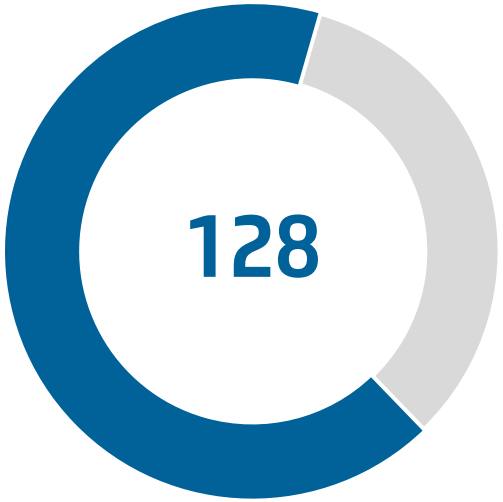
Concerns with decarbonization are restricting access to capital

Governments are setting ambitious decarbonization goals

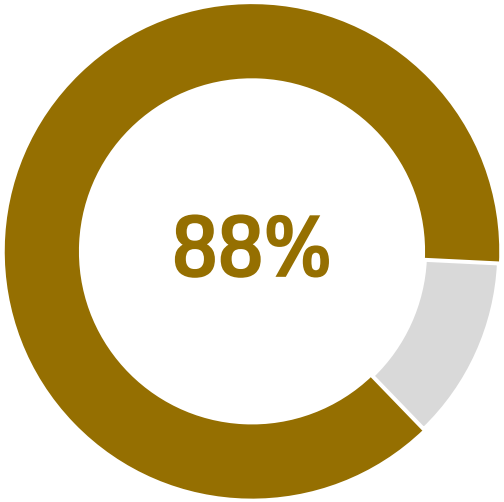
Net Zero Commitments – Global Coverage

Representation of countries with net-zero commitments announced until apr/23

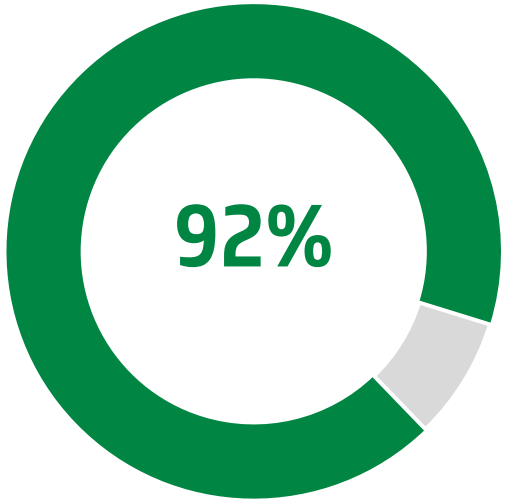
of countries



% of global emissions



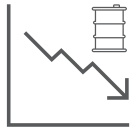
% of World GDP (PPP)



Source: Net Zero Tracker – data from apr/23 - Net Zero Tracker

Why is Petrobras decarbonizing?

Governments are setting ambitious decarbonization goals



Oil demand is forecasted to retract

Renewable sources of energy are becoming more competitive

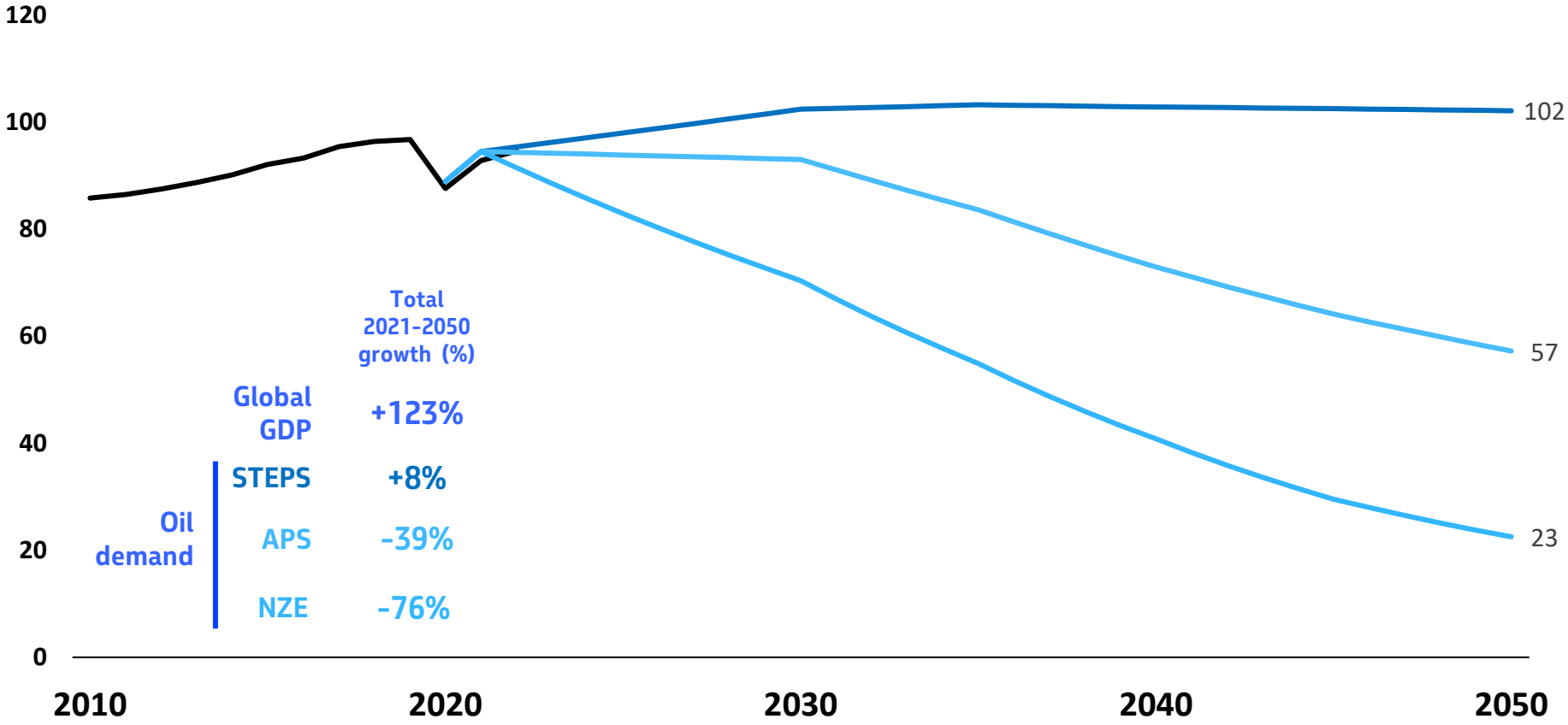
Transport, the key market for oil will be severely affected

Concerns with decarbonization are restricting access to capital

Oil demand is forecasted to retract

Crude oil demand - International Energy Agency Scenarios (WEO 2022)

MM bbl/d



International Energy Agency

Median Temperature increase until 2100

STEPS Stated Policies — **+2.5ºC**

APS Announced Pledges — **+1.7ºC**

NZE Net Zero Emissions by 2050 — **+1.4ºC**

Why is Petrobras decarbonizing?

Governments are setting ambitious decarbonization goals

Oil demand is forecasted to retract

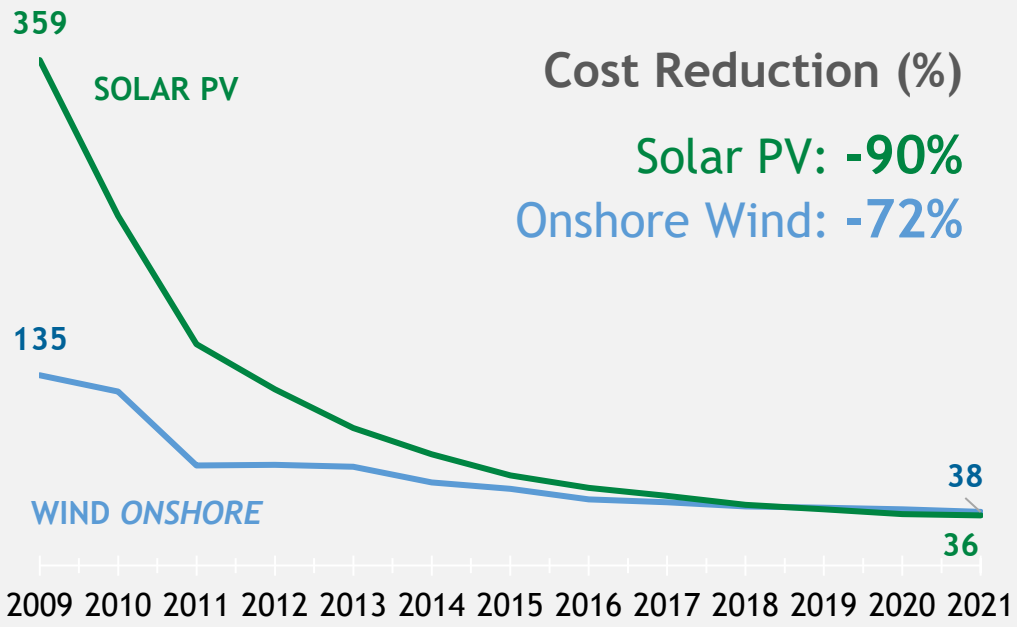
Renewable sources of energy are becoming more competitive

Transport, the key market for oil will be severely affected

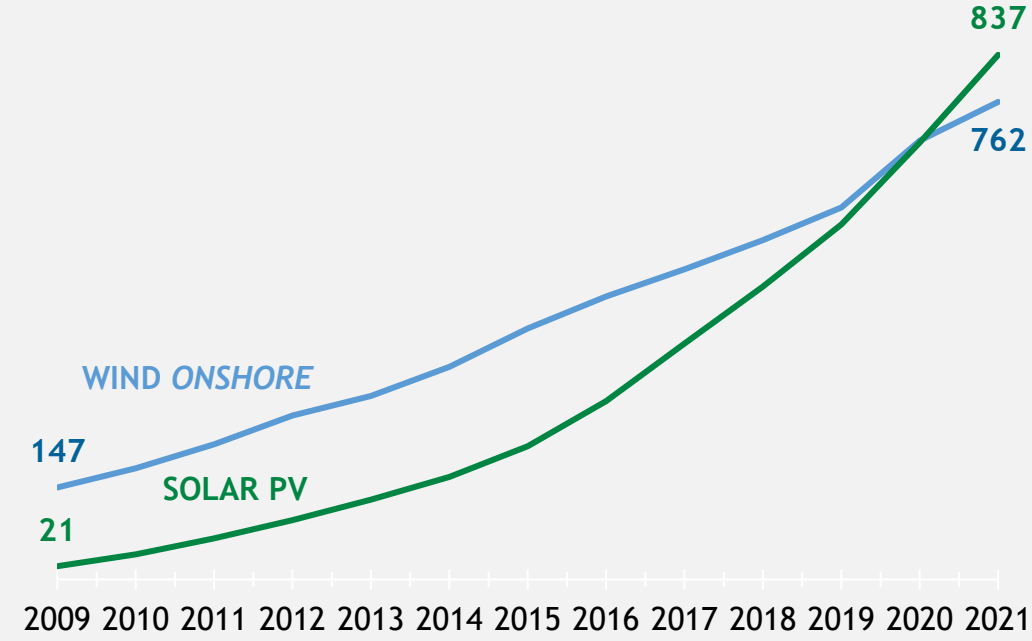
Concerns with decarbonization are restricting access to capital

Renewable sources of energy are becoming more competitive

LEVELIZED COST OF ENERGY - LCOE (US$/MWh)



GLOBAL SOLAR AND WIND GENERATION CAPACITY (GW)



Lazard / IHS Global Scenarios

Why is Petrobras decarbonizing?

Governments are setting ambitious decarbonization goals

Oil demand is forecasted to retract

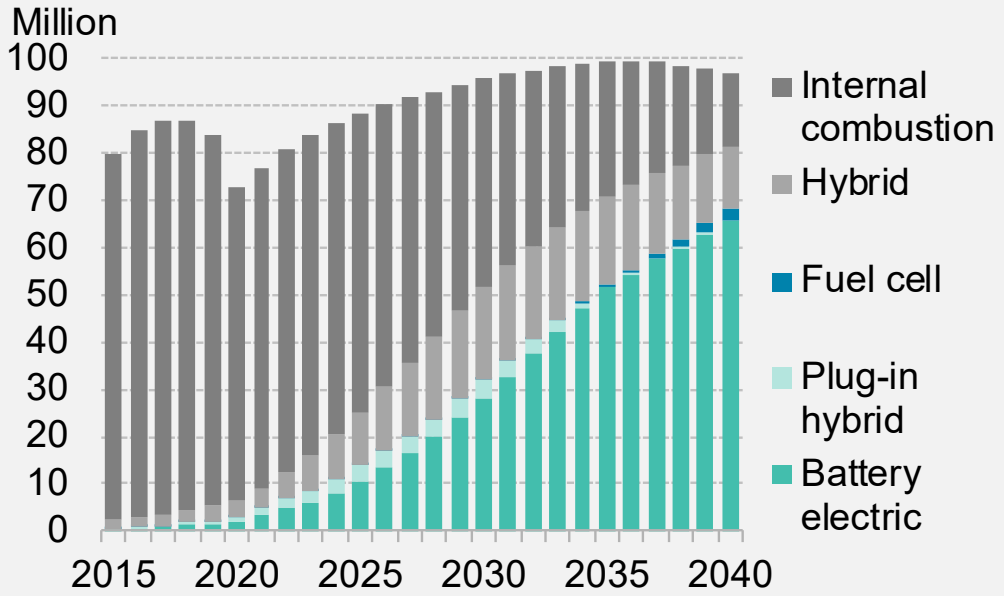
Renewable sources of energy are becoming more competitive

Transport, the key market for oil will be severely affected

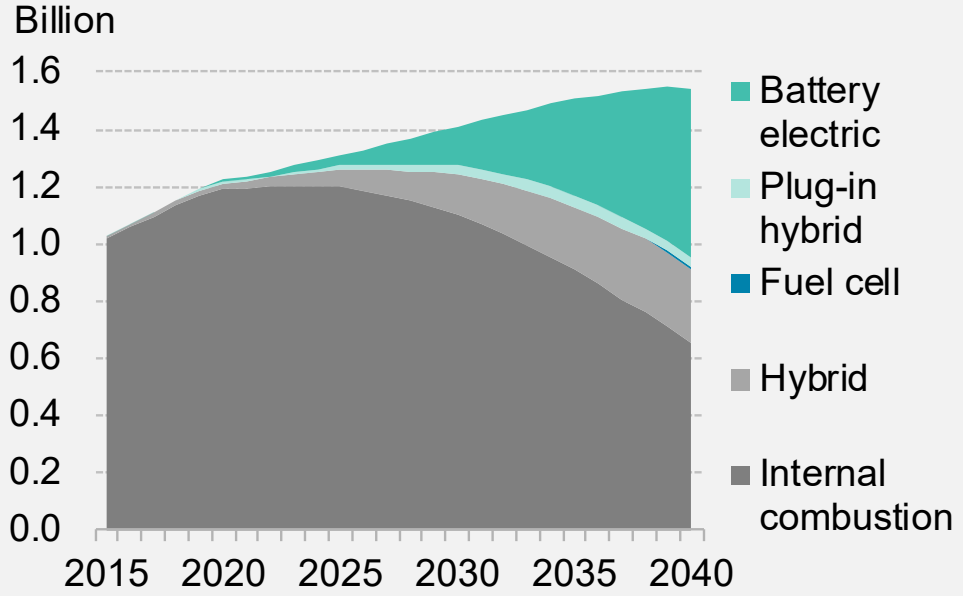
Concerns with decarbonization are restricting access to capital

Transport, the key market for oil will be severely affected

GLOBAL PASSENGER VEHICLE SALES OUTLOOK BY DRIVETRAIN
ECONOMIC TRANSITION SCENARIO



GLOBAL PASSENGER VEHICLE FLEET OUTLOOK BY DRIVETRAIN
ECONOMIC TRANSITION SCENARIO



Note: EVs include battery-electric and plug-in hybrid electric vehicles.
Electric Vehicles Outlook BNEF (2021)

Why is Petrobras decarbonizing?

Governments are setting ambitious decarbonization goals

Oil demand is forecasted to retract

Renewable sources of energy are becoming more competitive

Transport, the key market for oil will be severely affected

Concerns with decarbonization are restricting access to capital

Concerns with decarbonization are restricting access to capital

UN Net-Zero Banking Alliance

UN environment programme | finance initiative
Principles for Responsible Banking

43 Leading International Banks

40% World's banking assets

Institutional Investors Group on Climate Change

IIGCC
The Institutional Investors Group on Climate Change

400+ Members spread across 26 countries

60 € Trillion Combined assets

Key commitments:

Lending and investment portfolios GHG-neutral until 2050, aligned with Paris Agreement

To set interim targets for 2030 (or earlier), as well as define interim targets every 5 years, from 2030 onwards.

Ongoing actions:

Paris Aligned Investment Initiative (PAII) → Net Zero Investment Framework

Objectives:

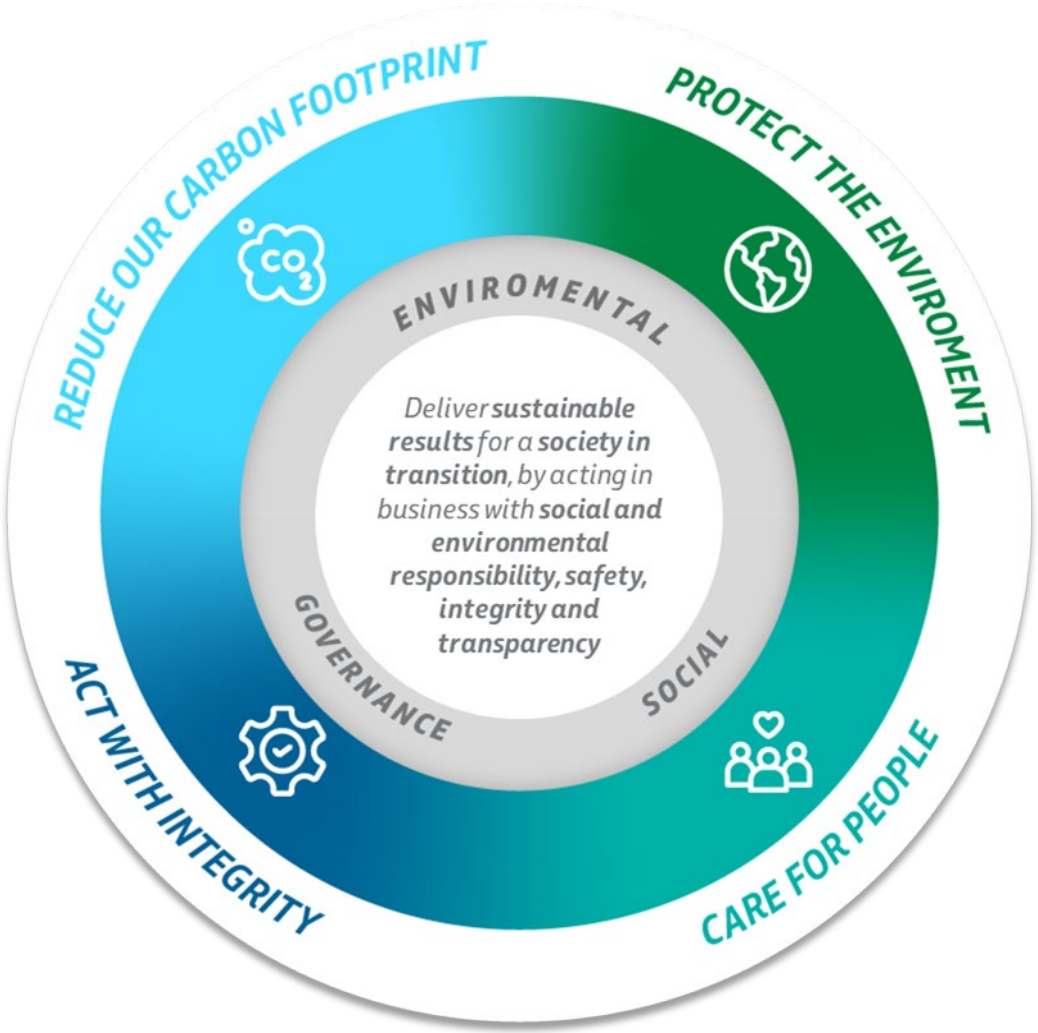
- Decarbonise investment portfolios
- Increase investment in climate solutions

These institutions may have to limit the capital available for the oil and gas industry due to stricter goals in the future

WHAT HAS PETROBRAS ALREADY ACHIEVED?

PETROBRAS

Our ESG Positioning



Our ESG Positioning

- Operational emissions neutrality in 2050
- Lower carbon products and businesses
- High quality carbon credits as a complementary strategy
- Innovation for energy and decarbonization solutions

Our Climate Goals

COMMITMENTS

- REDUCE ABSOLUTE EMISSIONS

- Reduction of total operational absolute emissions by 30%* by 2030
- Zero routine flaring by 2030

Our Climate Goals

COMMITMENTS

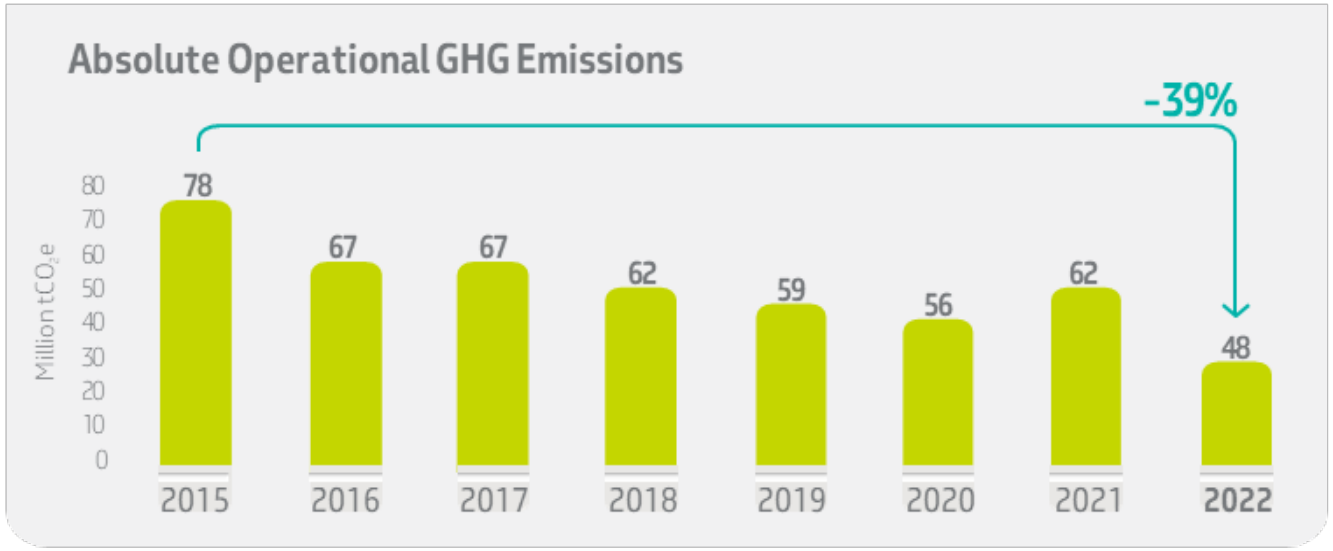
- REDUCE ABSOLUTE EMISSIONS

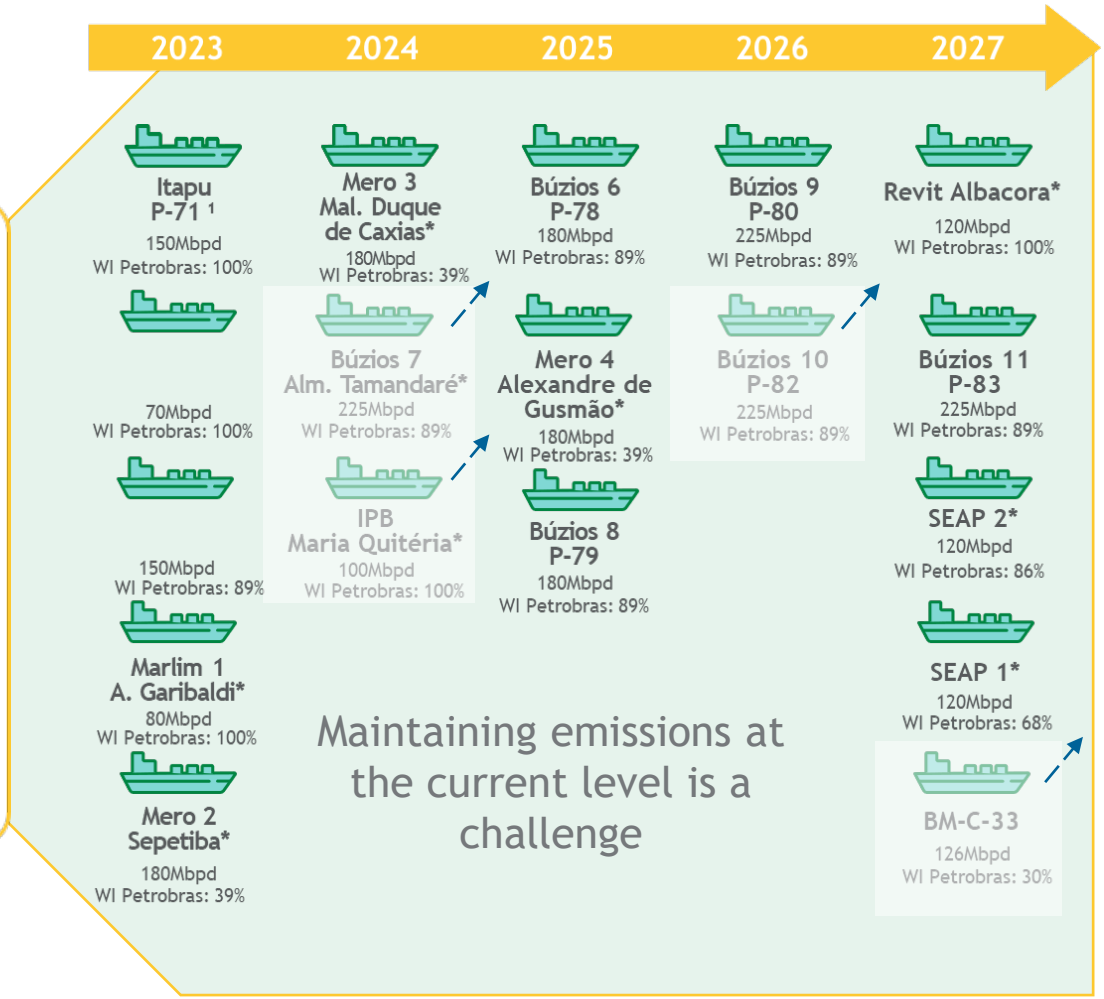
- **Reduction of total operational absolute emissions by 30%* by 2030**
- Zero routine flaring by 2030

Operational emissions and efficiency performance

For more than a decade, we have been working on decarbonization activities and we have a gradual and consistent GHG emission reduction

Absolute Operational GHG Emissions





Our Climate Goals

COMMITMENTS

- IMPROVE CARBON EFFICIENCY

- GHG intensity in the E&P segment: Achieve portfolio intensity of 15 $kgCO_2e/boe$ by 2025, **maintaining 15 $kgCO_2e/boe$ by 2030**

- Reinjection of **80 million tCO_2 by 2025 in CCUS-EOR projects**

- GHG intensity in the Refining segment: Achieve an intensity of 36 $kgCO_2e/CWT$ by 2025 and **30 $kgCO_2e/CWT$ by 2030**

Our Climate Goals

COMMITMENTS

- IMPROVE CARBON EFFICIENCY

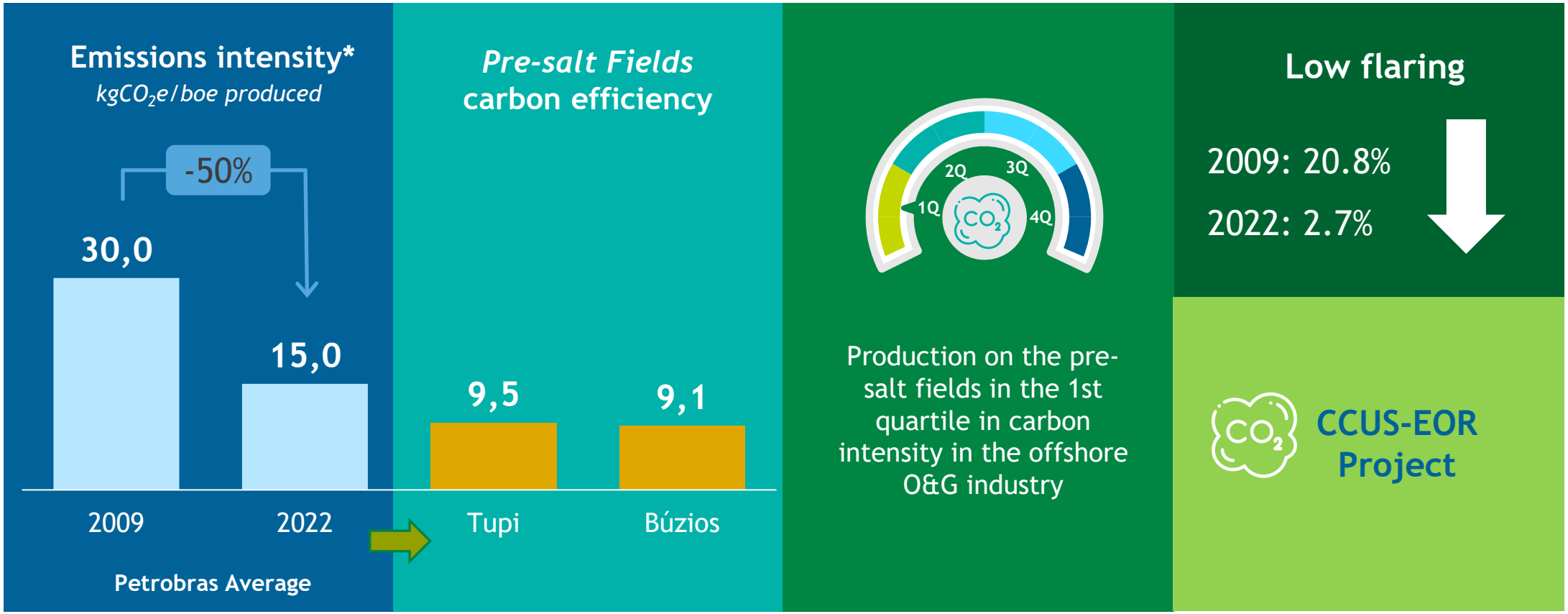
- **GHG intensity in the E&P segment: Achieve portfolio intensity of 15 $kgCO_2e/boe$ by 2025, maintaining 15 $kgCO_2e/boe$ by 2030**

- Reinjection of 80 million tCO2 by 2025 in CCUS-EOR projects

- GHG intensity in the Refining segment: Achieve an intensity of 36 $kgCO_2e/CWT$ by 2025 and 30 $kgCO_2e/CWT$ by 2030

Improve Carbon Efficiency

Results of past technological choices



Industry Average IOGP (International Association of Oil & Gas Producers) 2021:17.6 $kgCO_2e/boe$
Tupi and Buzios Fields represent about 50% of Petrobras total production

Our Climate Goals

COMMITMENTS

- IMPROVE CARBON EFFICIENCY

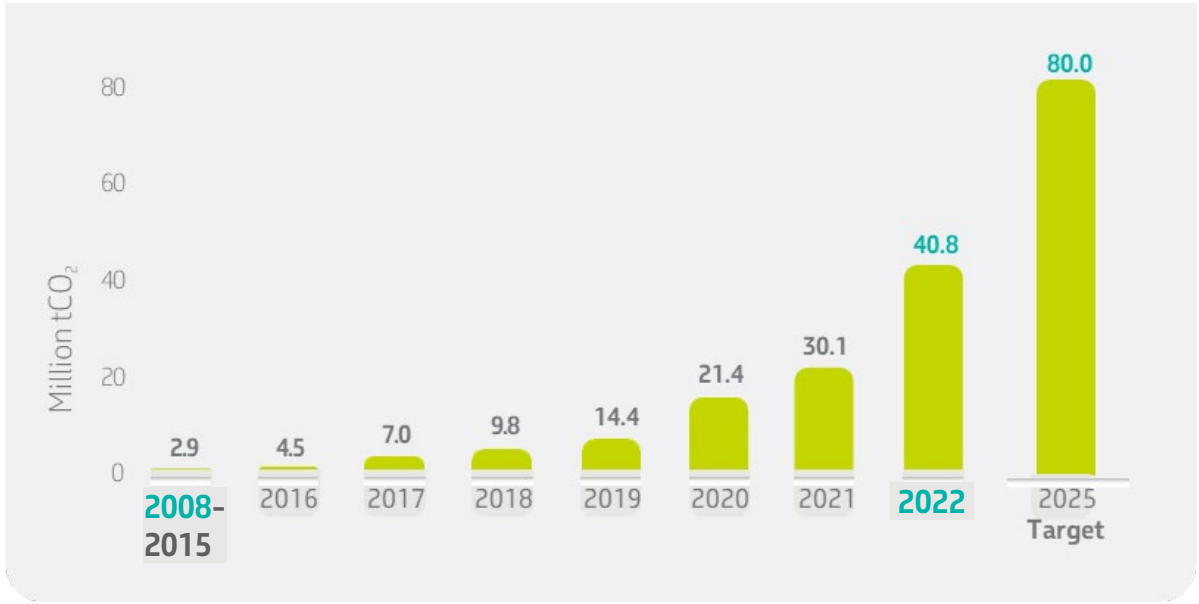
- GHG intensity in the E&P segment: Achieve portfolio intensity of 15 kgCO2e/boe by 2025, maintaining 15 kgCO2e/boe by 2030

- **Reinjection of 80 million tCO2 by 2025 in CCUS-EOR projects**

- GHG intensity in the Refining segment: Achieve an intensity of 36 $kgCO_2e$/CWT by 2025 and 30 $kgCO_2e$/CWT by 2030

CCUS-EOR in ultra-deepwaters

Accumulated CO_2 reinjection

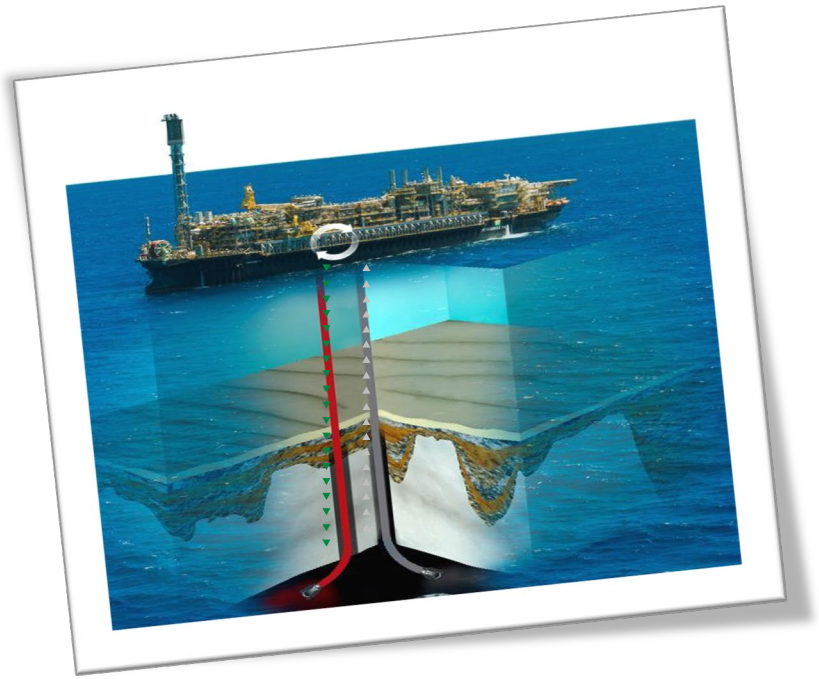


2022

10.6 million tons of CO_2 reinjected

World largest CCUS project operated

After a long and innovative technological journey, we have recently set a target to ***double*** *the cumulative amount of CO_2 reinjection within the* ***next three years***.



CCUS-EOR: Carbon Capture, Utilization and Storage, associated with EOR – Enhanced oil Recovery

Our Climate Goals

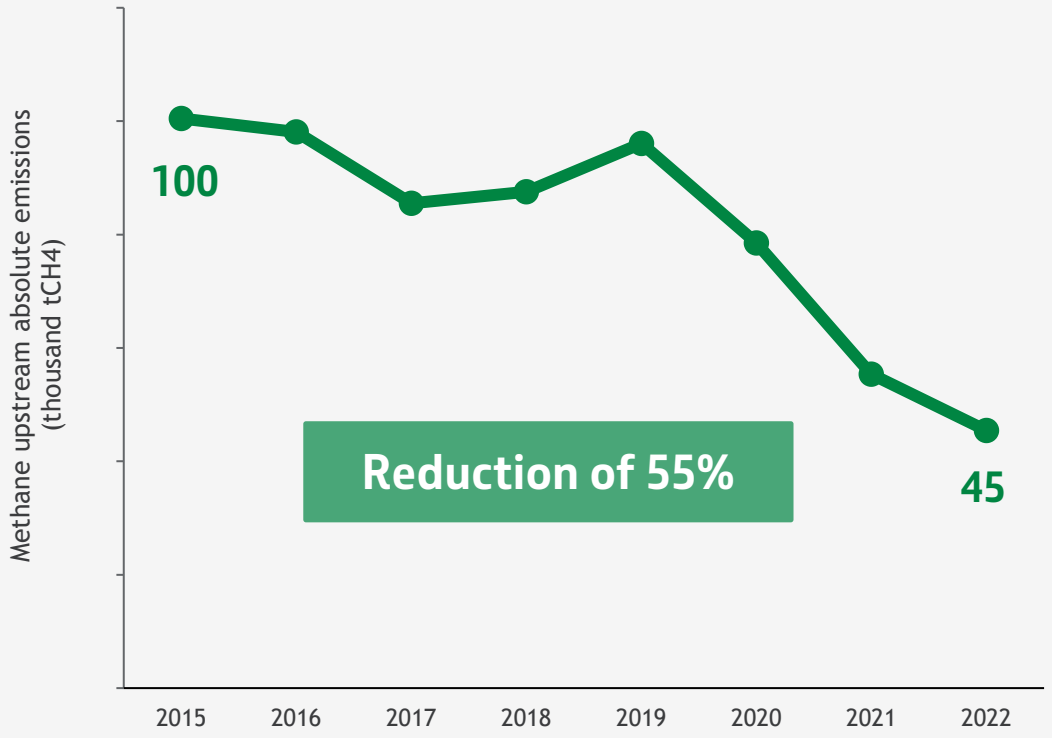
COMMITMENTS

- NEAR ZERO METHANE

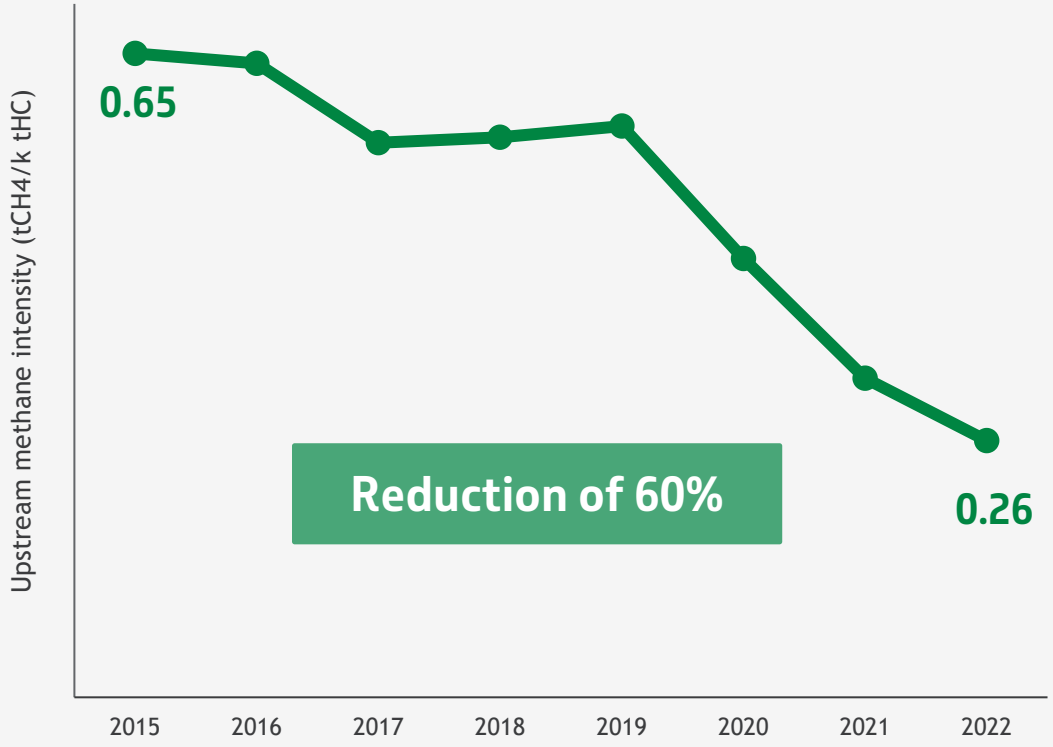
- **Consolidation of 55%* reduction in the intensity of methane emissions in the upstream segment by 2025, reaching 0.29 t CH4/thousand tHC**

Methane perfomance: focus in upstream

Methane absolute emissions of upstream
(1000 tCH_4)



Upstream methane intensity
(tCH_4/1000 t hidrocarbon)



Levers: Reduce Flaring, Reduce Venting and Eliminate Fugitives

Oil and Gas Methane Partnership 2.0 (OGMP)

Petrobras joined in 2023 the **OGMP 2.0**

- The initiative defines a framework for reporting methane emissions to the oil and gas industry. This framework acts as an incentive for operators to improve their methane measurements.
- With this commitment, Petrobras demonstrates a greater commitment to this critical theme, equating to its peers and with benefits in terms of image

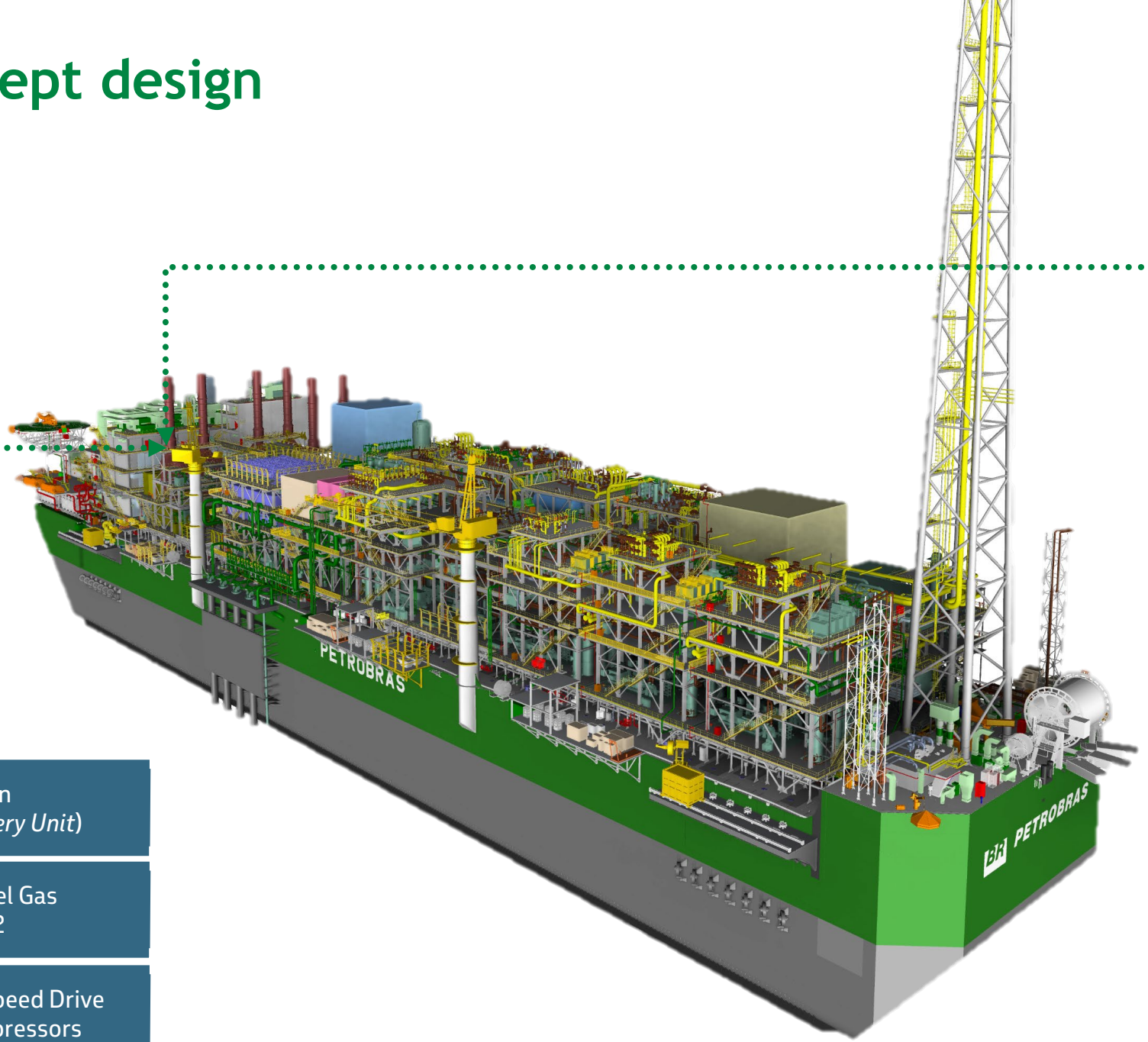
WHAT IS PETROBRAS DOING FOR THE FUTURE?

PETROBRAS

IGEE - GHG SOURCES[1]

[1] Typical order of magnitude, depending upon the oil field and FPSO design

New concept design



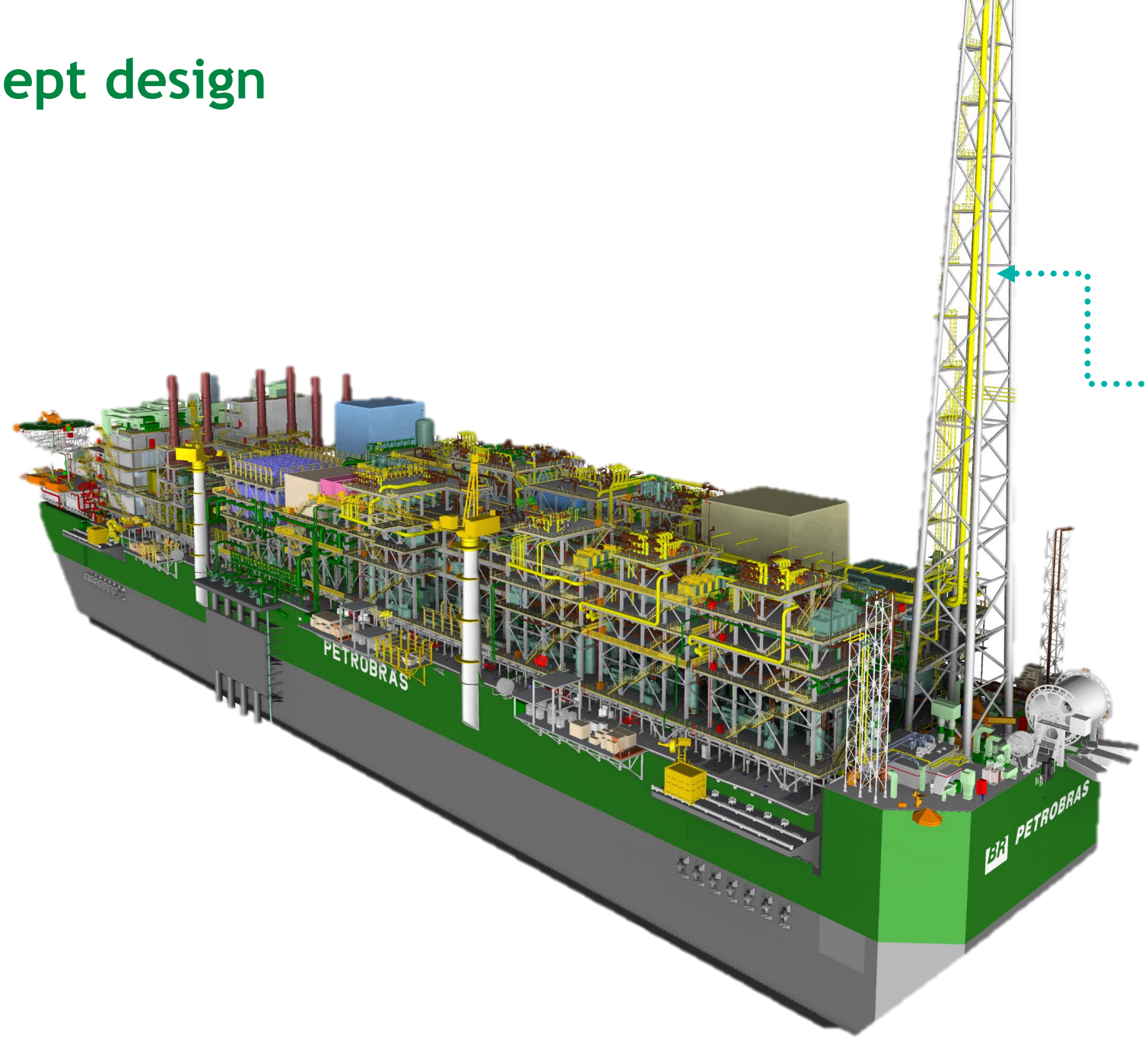
- Topsides electrification (All Electric >100MW)
- Carbon Capture Use and Storage (CCUS)
- Deep seawater intake (~100m)
- Increase in oil treatment temperature
- Seawater cooling and gas treatment/compression system optimization

- Cogeneration (*Waste Heat Recovery Unit*)
- Treatment of Fuel Gas with 3% CO2
- Hydraulic Variable Speed Drive (HVSD) in gas compressors

IGEE - GHG SOURCES[1]

[1] Typical order of magnitude, depending upon the oil field and FPSO design

New concept design



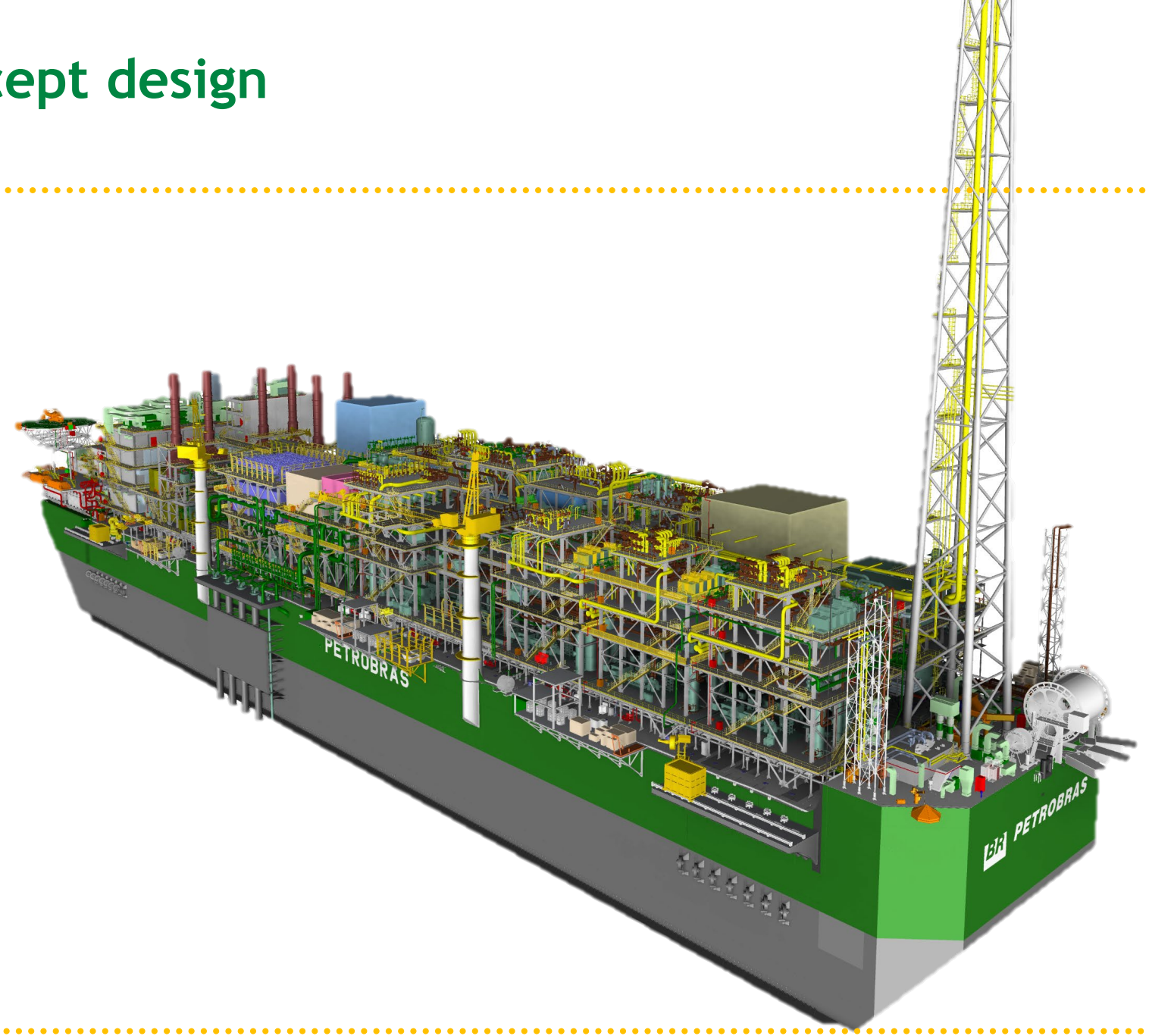
- Flare Gas Recovery System
- High efficiency burners
- Pressurized stop of compression systems

IGEE - GHG SOURCES[1]

Venting and Fugitives (10%)

[1] Typical order of magnitude, depending upon the oil field and FPSO design

New concept design

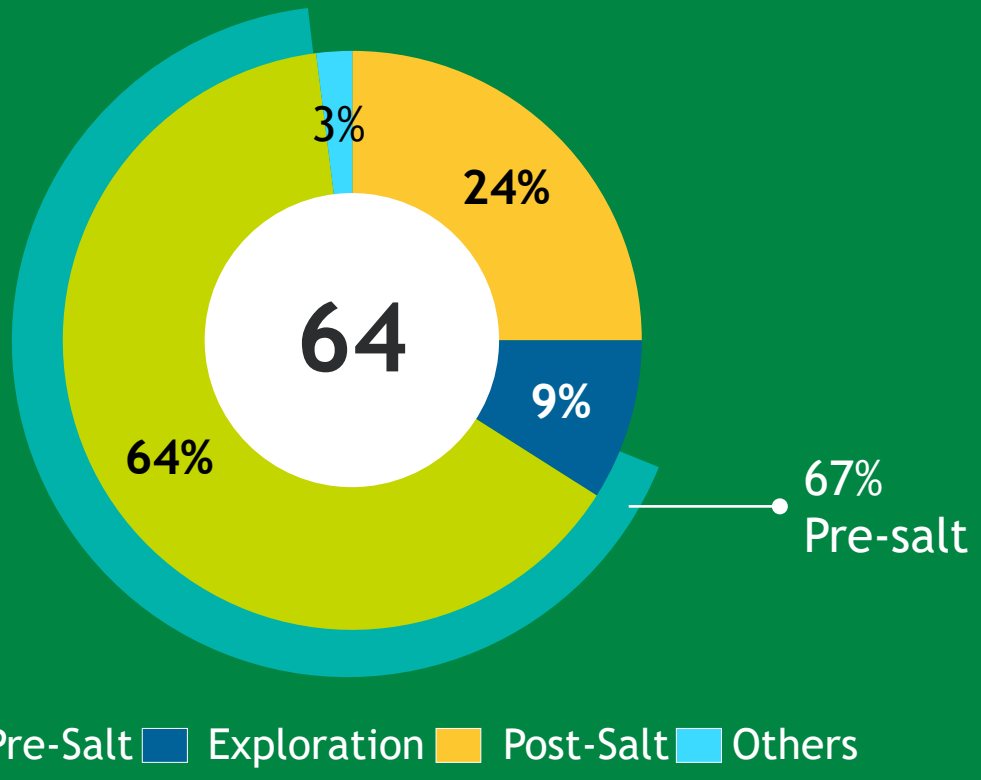


- Process Ventilated Gas Recovery System
- Low fugitive emissions valves
- Reduction of oil storage temperature to reduce vented gas flow
- Cargo TKs HC Blanketing and Recovery

Resilient Oil and Gas for Energy Transition

STRATEGIC PLAN 2023-27

US$ billions



DOUBLE RESILIENCE

ECONOMIC

Brent

35

US$/bbl in the long term

ENVIRONMENTAL

Emission intensity

15

Kg CO_2e/boe

Investments to strengthen our low carbon position over the period 2023-2027

US$ 3,7 billion

DECARBONIZATION OF OPERATIONS

US$ 0,6 billion

BIOREFINING

US$ 0,1 billion

OTHER RENEWABLES AND LOW CARBON TECHNOLOGIES AND PRODUCTS

US$ 4,4 billion (6% of total CAPEX)

* Expenditures classified as CAPEX can be allocated as OPEX for amounts related to the decarbonization fund and R&D expenditures |** The forecast expenditures for the low carbon portfolio correspond to 10% of the total R&D budget, which depend on the legal obligation.

Investments to strengthen our low carbon position over the period 2023-2027

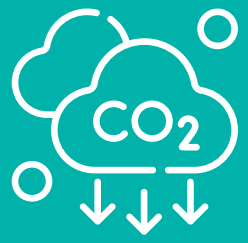
Other renewables and low carbon technologies and products

Priorities for grow

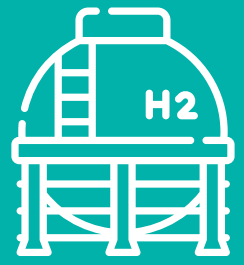
Wind Power

Low carbon products

Carbon Capture



Hydrogen




THANK YOU