DEEP DIVE
PETROBRAS 2024

January 30

PETROBRAS

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We present certain data in this presentation, such as oil and gas resources and reserves, that are not prepared in accordance with the United States Securities and Exchange Commission (SEC) guidelines under Subpart 1200 to Regulation S-K, and are not disclosed in documents filed with the SEC, because such resources and reserves do not qualify as proved, probable or possible reserves under Rule 4-10(a) of Regulation S-X.

DEEP DIVE
PETROBRAS *2024*

Jean-Paul Prates
CEO

PETROBRAS

A NEW ROADMAP

Our toolkit

Strategy consistent with perspectives for oil demand and energy transition

Stellar project management and R&D as foundations for our success

Solid governance to guide our decisions on highly profitable projects and M&A

Consistent returns and profits, while keeping our leverage under control, to ensure value generation for our shareholders and society

Highlights
on Upstream

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Highlights ***on Upstream***

Solid growth in O&G production, reaching 3.2 Mmboed in 2028.

- Focus on highly profitable assets, with US$ 25/bbl average prospective breakeven and 23% IRRs.
- Reevaluation of portfolio in search of synergies and economic diversification.
- Outstanding asset base, with solid metrics for organic reserves replacement.
- New frontiers in exploration: Equatorial Margin stands out. International co-op under consideration.
- Cutting-edge technologies driving higher efficiency and enabling value generation.

Highlights
on Downstream

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Highlights
on Downstream

Integration as the main driver to monetize reserves and to allow for growth in biofuels

- Focus on energy efficiency and operational performance
- Adapt to demand shifts
- Research ways to anticipate and influence patterns of consumption
- Low carbon products as a business opportunity
- Increase capacity to meet demand and enhance flexibility

Highlights
on Low Carbon

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Highlights
on Low Carbon

Decarbonization of operations a focus for scopes 1 and 2. Brazil is rich in business opportunities for scope 3:

Offshore and onshore wind

Hydrogen

CCUS

Solar power

Biorefining

Highlights
on Financial Strategy and Governance

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Highlights
on Financial Strategy and Governance

Strategic Plan to be carried out with leverage under control and with capital discipline

- Governance strengthened, with a robust process, full accountability and inside and outside scrutiny
- Robust legal framework as the cornerstone for profitable and responsible business decisions
- Solid free cash flow to fund the transition, with profitable projects and partnerships as a priority
- Dividends as an important value proposition for shareholders and society

Highlights
on Social Responsibility

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Highlights
on Social Responsibility

Putting people front and center

- Diversity, Equity and Inclusion Policy
- Building a strong relationship with the public to ensure legitimacy in operations

THE CHALLENGE

The Challenge

Oil and Gas sector under increasing public pressure: we must respond by developing a reasonable timeframe for transition that ensures energy security while demonstrating ambition in the search for new energy sources

Reliable and efficient supply chains are crucial to carry out the strategic plan, otherwise, we risk being outpaced by the energy transition.

Decreasing demand for fossil fuels will open up opportunities for other less carbon-intensive uses for oil

Economic diversification into renewables require a cautious and responsible approach to avoid setbacks and chillover effects

Another achievement of the creativity and innovation potential of our employees and the Brazilian people.

We were recognized for the fifth time with the OTC award, this time for the revitalization of the Campos Basin.

The largest recovery program for mature deepwater assets worldwide achieved a 55% reduction in greenhouse gas emissions.

DEEP DIVE
PETROBRAS 2024

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Thank you

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PETROBRAS *2024*

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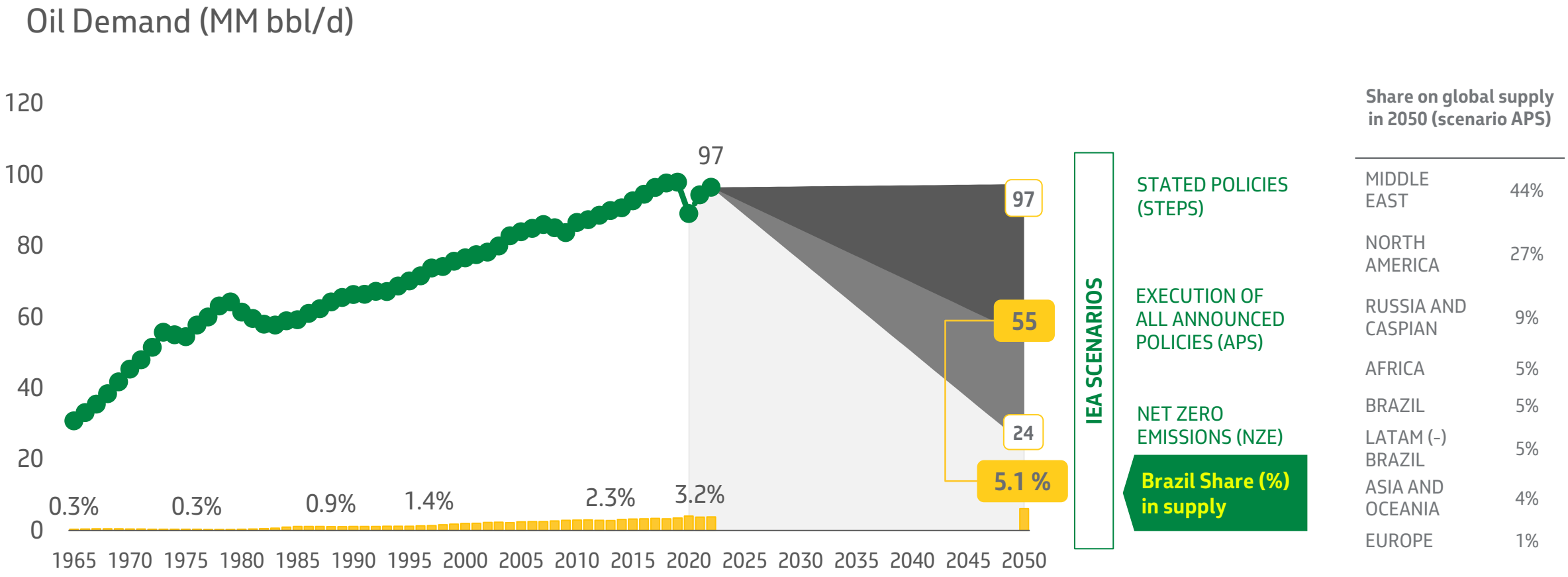
Exploration & Production

Joelson Mendes

Despite the ongoing energy transition, scenarios indicate that there will still be demand for oil in the long run and Brazil is going to supply 5% of this demand



Share on global supply in 2050 (scenario APS)

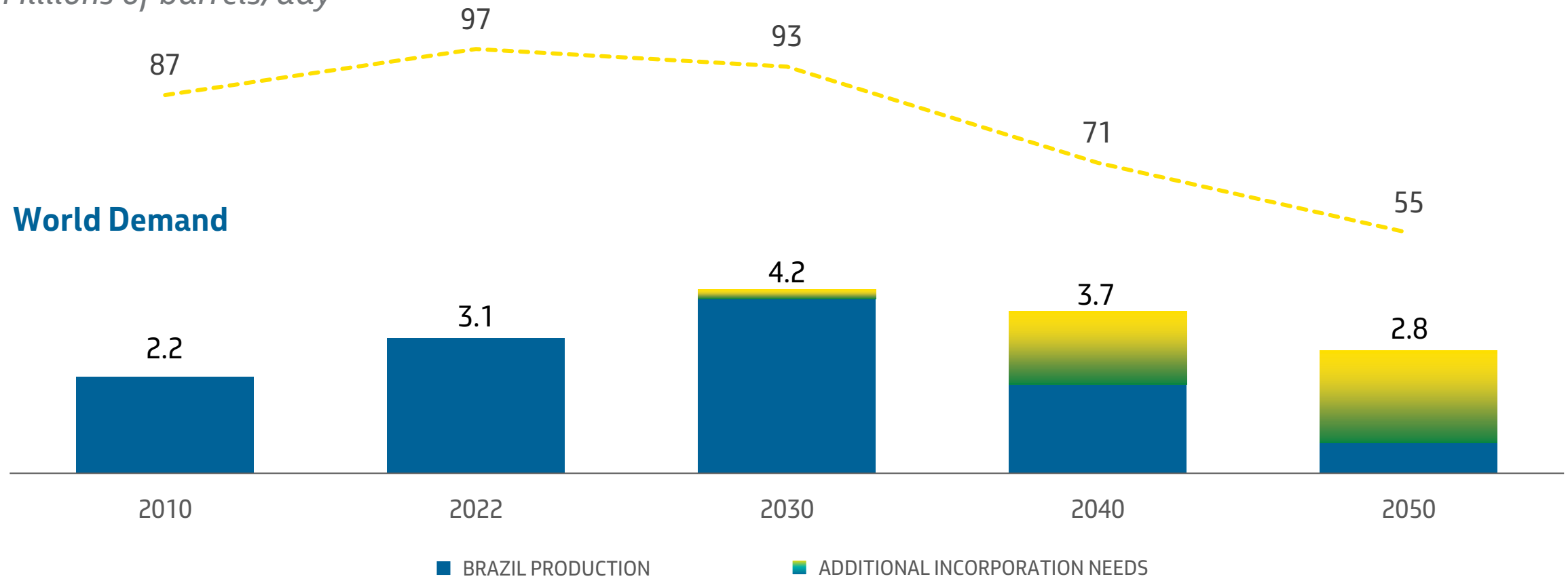
MIDDLE EAST	44%
NORTH AMERICA	27%
RUSSIA AND CASPIAN	9%
AFRICA	5%
BRAZIL	5%
LATAM (-) BRAZIL	5%
ASIA AND OCEANIA	4%
EUROPE	1%

Sources: Statistical Review of World Energy BP (2023); World Energy Outlook IEA (2023)

The world still needs additional incorporation to replace reserves and Brazil can supply it with lower emission and competitive costs

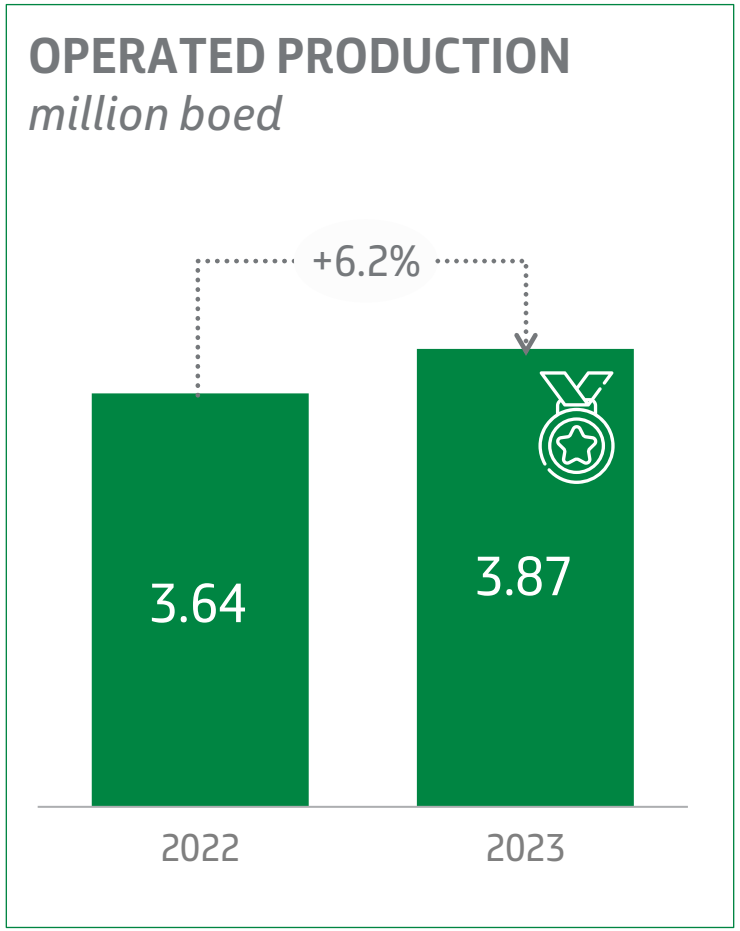
Oil Demand on Paris Agreement Fullfillment, IEA 2022

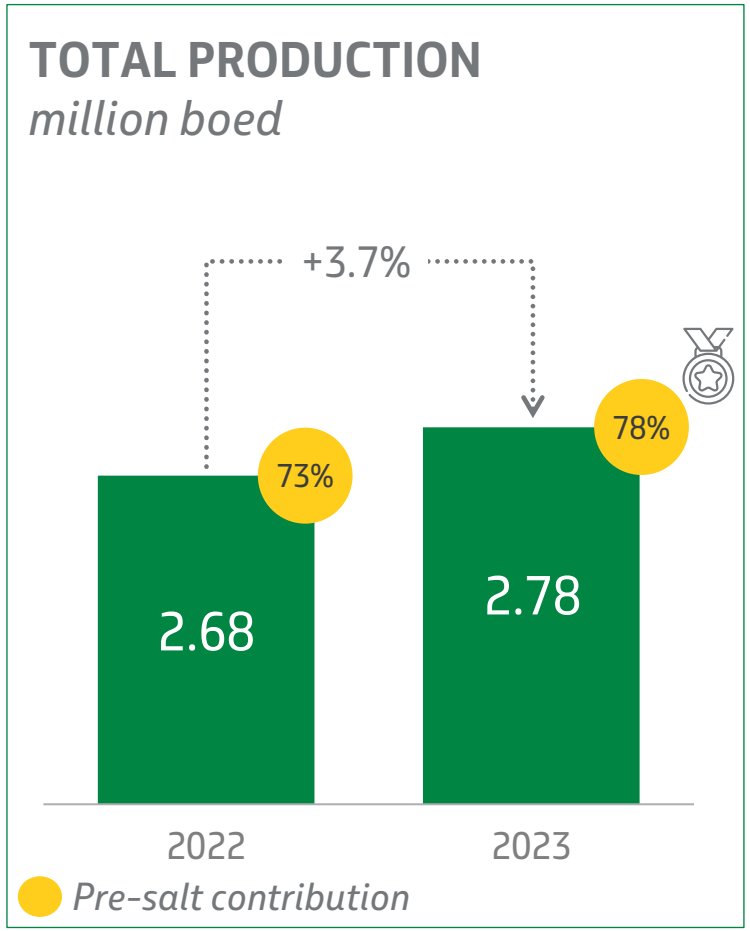
Millions of barrels/day

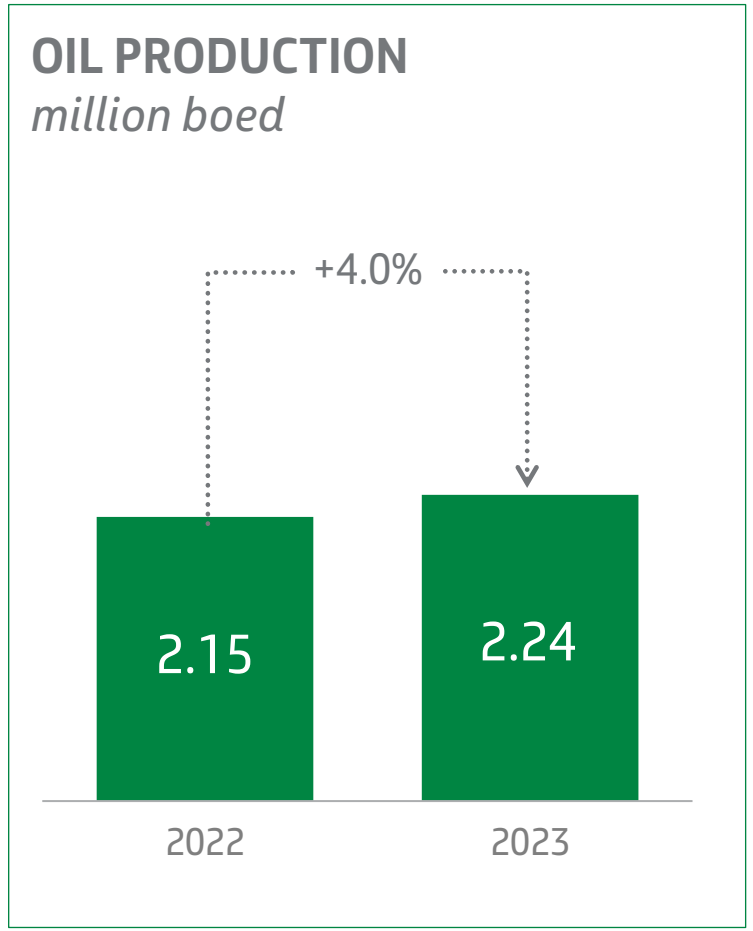


Sources : BP statistical review of world energy 2023, WEO IEA (2023); World Energy Outlook 2023, International Energy Agency (IEA)

We have established two new records on Operated Production and Pre-salt contribution. Total and Oil Production also grew relative to 2022





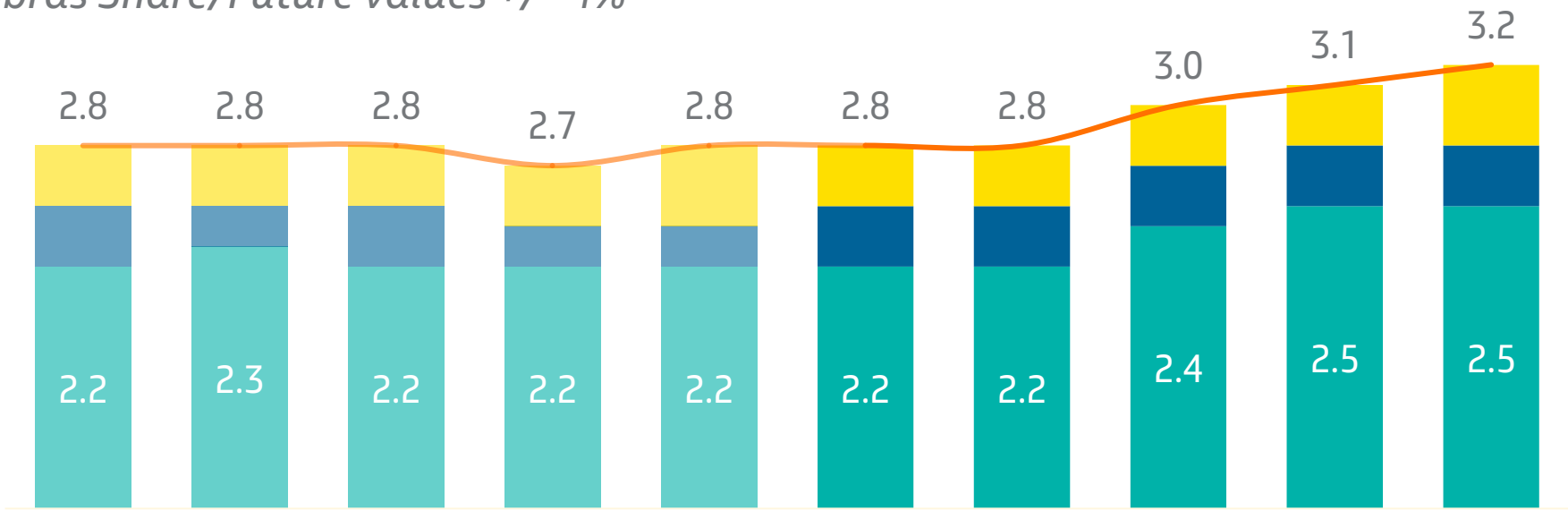


We reached these important production milestones and records, alongside very good results in HSE.

Our production is steadily increasing until 2028

Total Production

Mmboed/Petrobras Share/Future values +/- 4%



	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
% Presalt	55%	66%	70%	73%	78%	80%	77%	77%	77%	79%
*Operated Production**	3.5	3.6	3.6	3.6	3.9	3.9	3.9	4.3	4.6	4.6

** Operated production includes the Federal Government's production as profit oil from production sharing contracts*

Due to the complexity of the business, for our production forecast, we adopted a probabilistic analysis to incorporate uncertainties and unplanned events

INPUTS

Production
Model
Aggregated
by Project

PROBABILISTIC EFFICIENCY
Each pp in efficency can affect production in **20 KBPD/YEAR**

140 COMPLEMENTARY PROJECTS to implement in 5 years

14 PLATFORMS
Start-up dates
In 5 years to evaluate

RESERVOIR UNCERTAINTIES
P10, P50 and P90 approach for each field. **Less mature fields have higher uncertainties**

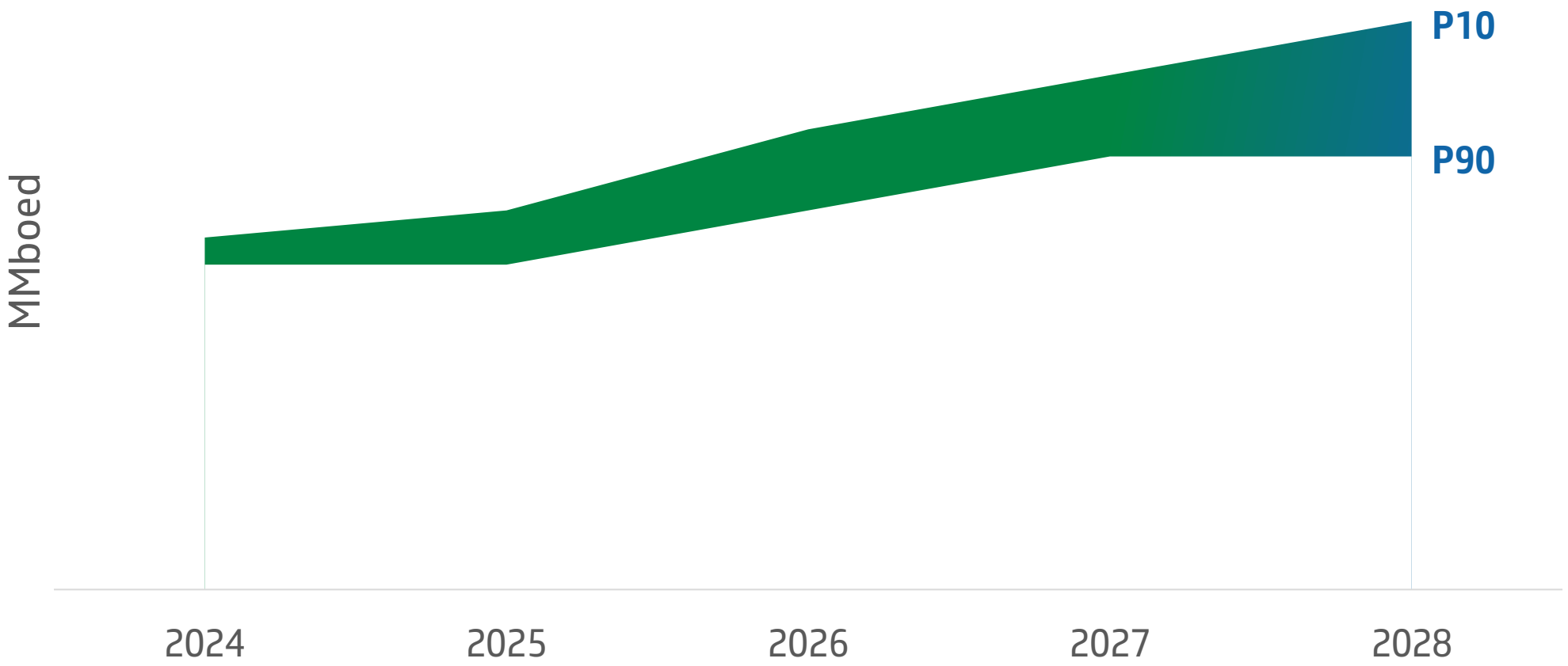
DISRUPTIVE RISKS
Unplanned events on major systems with potential material impact on annual production

OUTPUT

Production
Tunnel
Risk

The Production Tunnel Risk is the output of this probabilistic analysis and the basis for our production forecasting

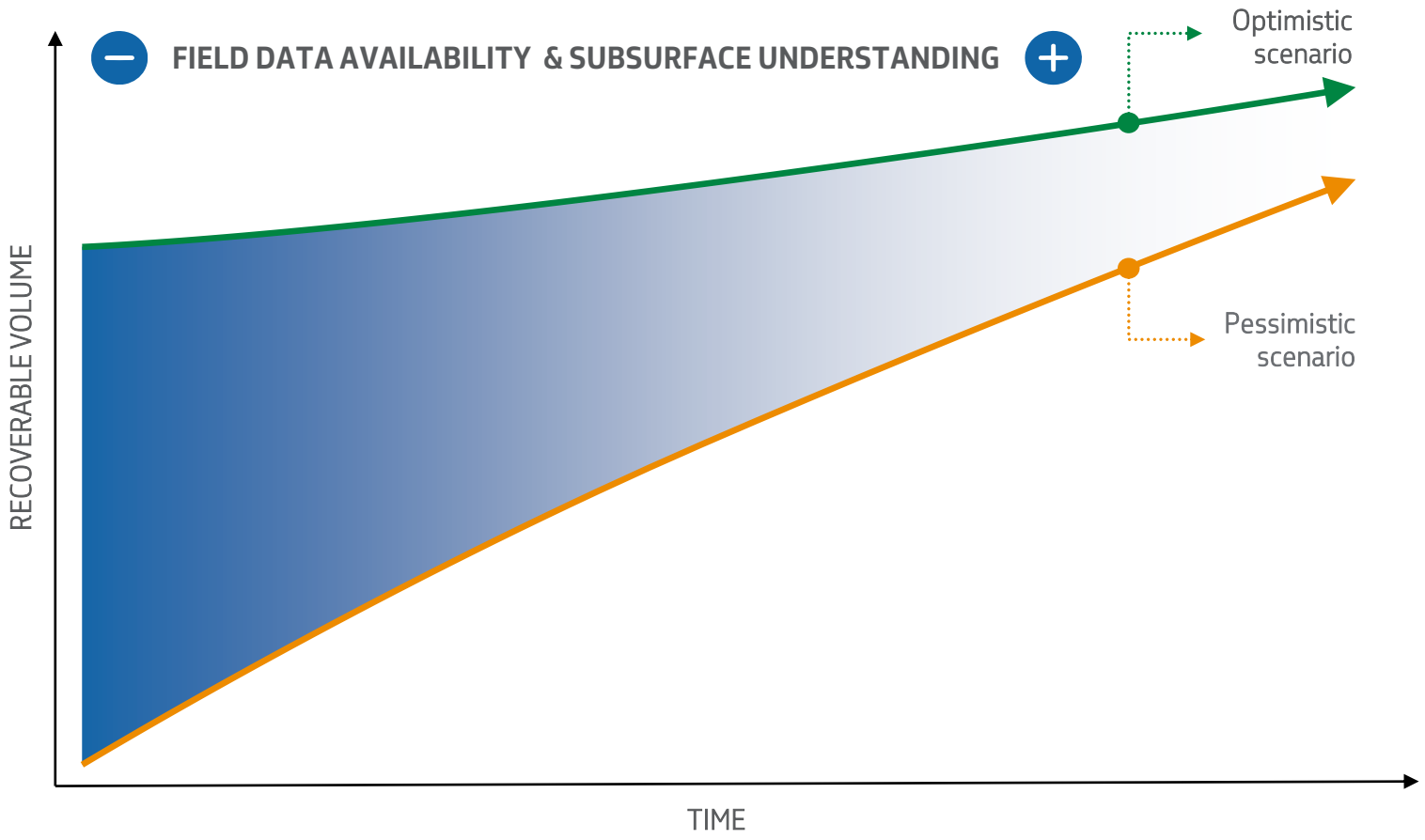
Production Tunnel Risk



The accuracy of our forecast was possible due to technical improvements incorporated in the probabilistic production projection model

The technical work of the projections is a long-term construction so that we can continue with high precision in all the five-year projections

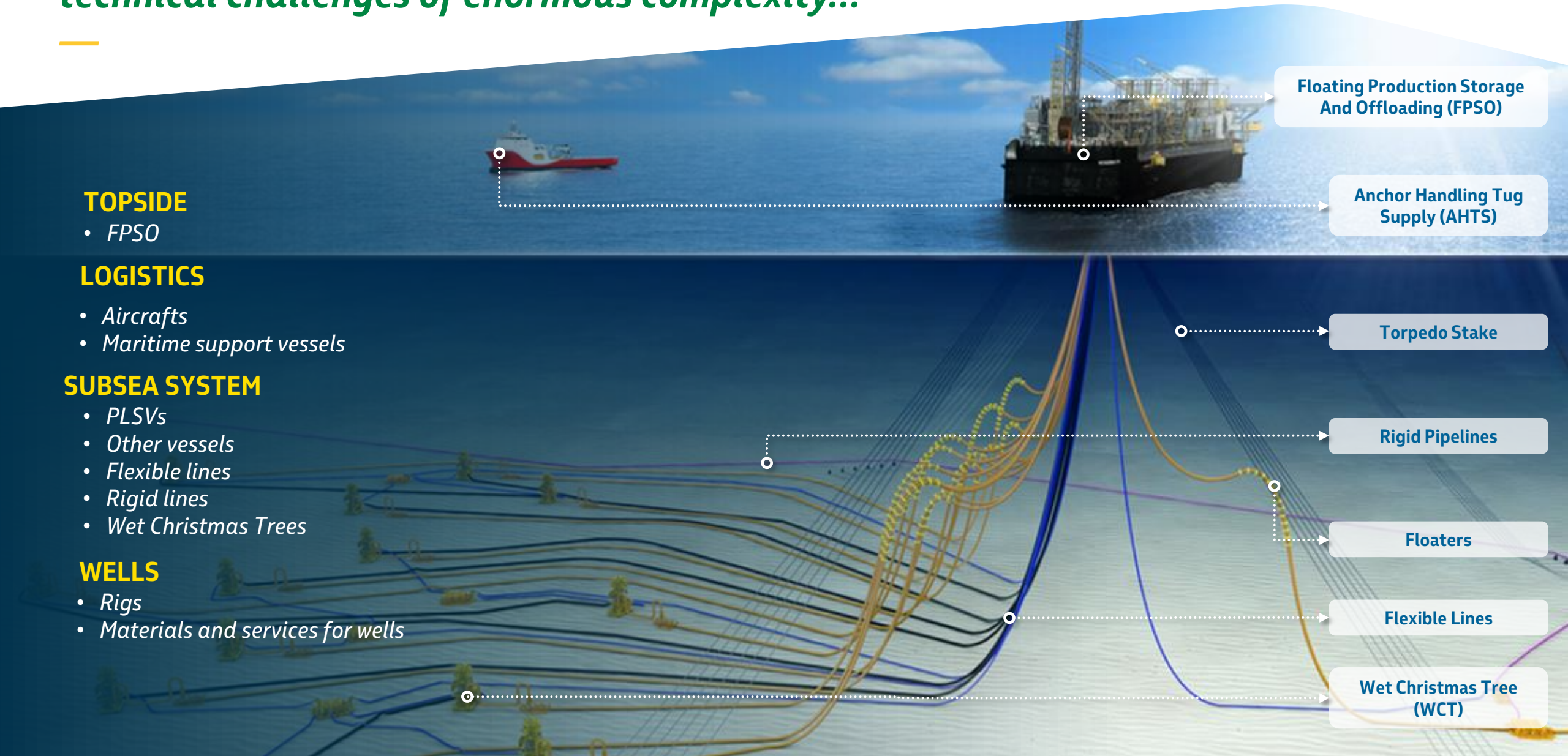
Uncertainties remain until the end of each field's service life, but they are reduced with the availability of new data and its constant incorporation in the reservoir models



MAIN RESERVOIR UNCERTAINTIES

- *Rock properties*
- *Fluid properties*
- *Rock-fluid interaction*
- *Fluid contacts*
- *STOOIP*
- *Dynamic behavior*

A single FPSO installed in deepwater contains multiple technical challenges of enormous complexity...



TOPSIDE
- *FPSO*

LOGISTICS
- *Aircrafts*
- *Maritime support vessels*

SUBSEA SYSTEM
- *PLSVs*
- *Other vessels*
- *Flexible lines*
- *Rigid lines*
- *Wet Christmas Trees*

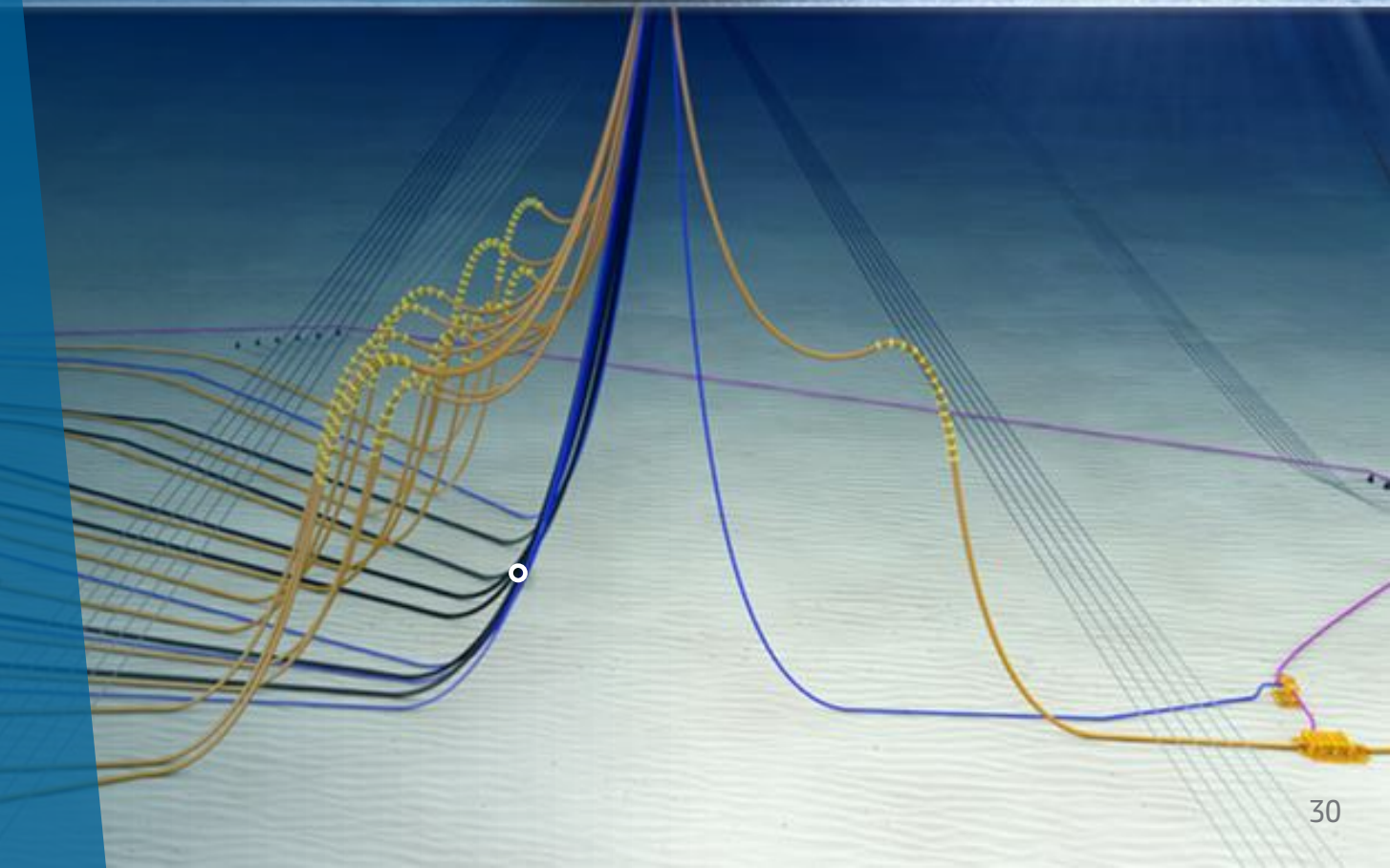
WELLS
- *Rigs*
- *Materials and services for wells*

...and if we zoom into a specific example we have an order of magnitude of the enormous task we face to forecast events into the future

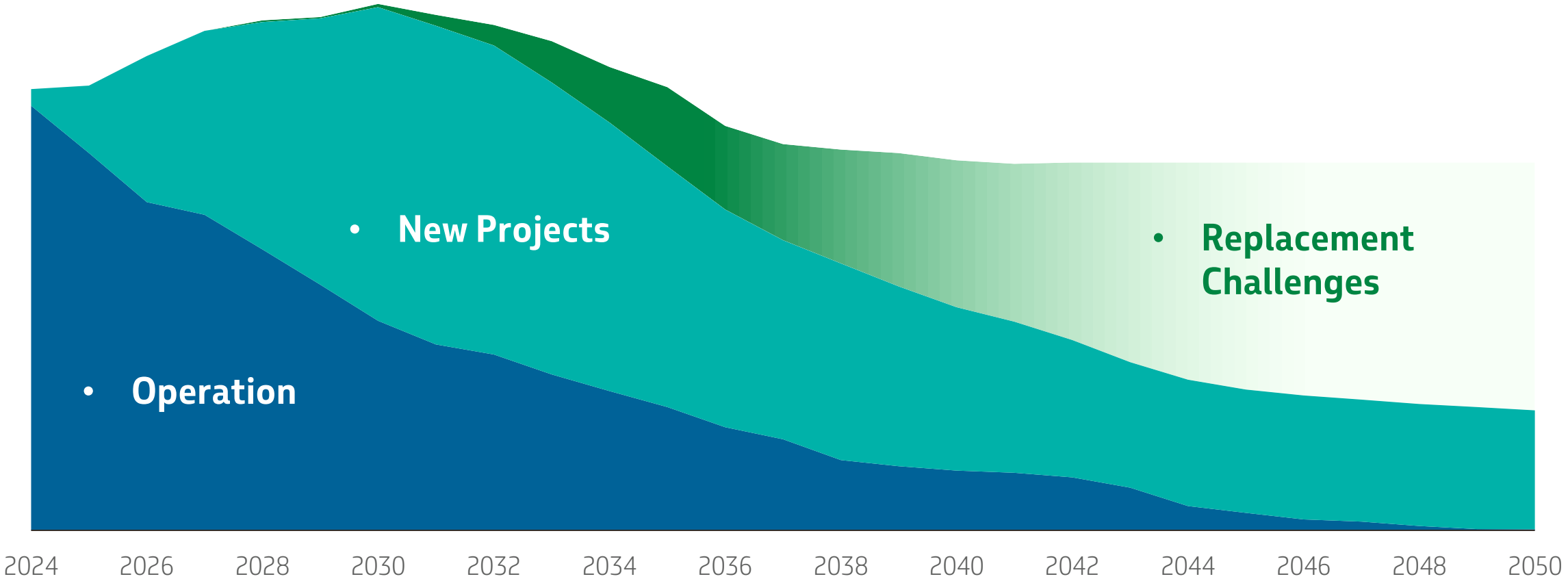
—

P-77 (Búzios Field)

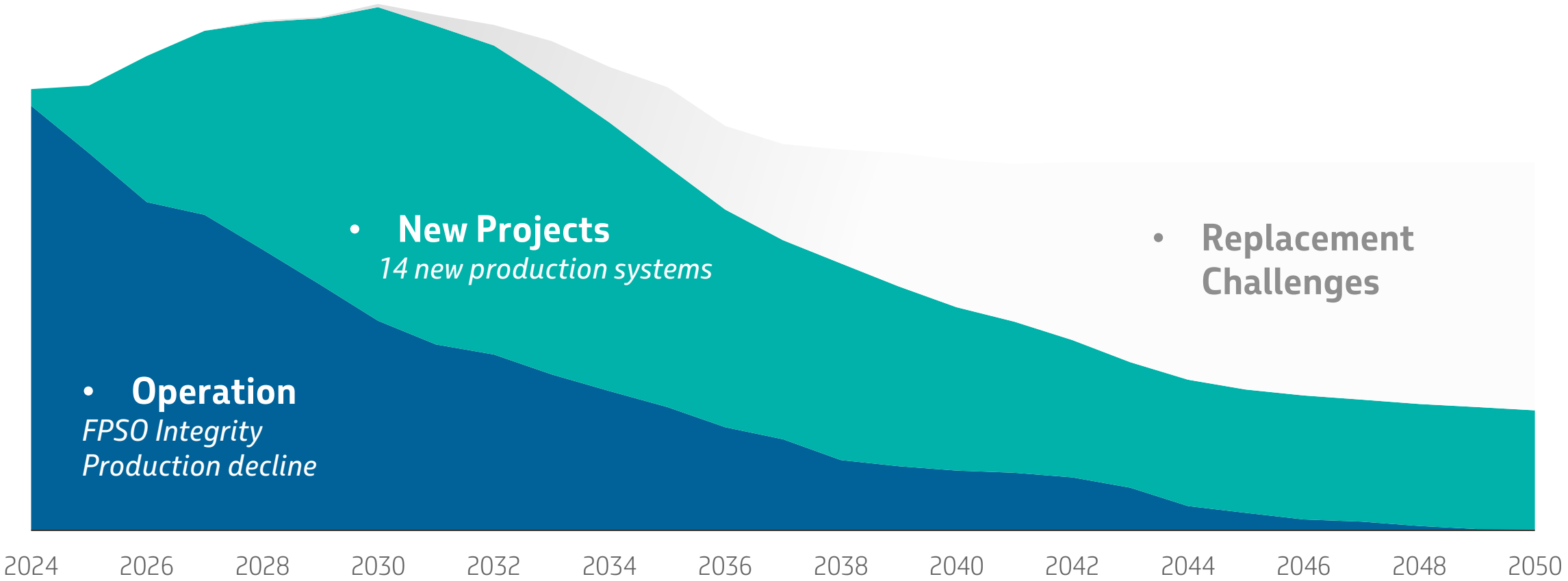
- Oil Processing Capacity: 150 kbpd
- Gas Processing Capacity: 6 MMm^3
- Lightship Weight: 78 Mt
- Distance from the coast: 200 km
- Water Depth: 1,980 m
- Lines of Service and Production: 60 km
- Lines of Water and Gas Injection: 50 km
- Control Umbilicals: 60 km
- Gas Pipeline: 9 km
- Safety Critical Elements: 4,900



We will stay focused on the diversification of our portfolio and on the challenge of replacing reserves, with lower emissions, for a just energy transition



We have dedicated teams that are constantly looking for both operation and projects opportunities



Over the years, the importance and challenges of offshore Integrity Management grow...

57 Platforms in operation

14 To be deployed

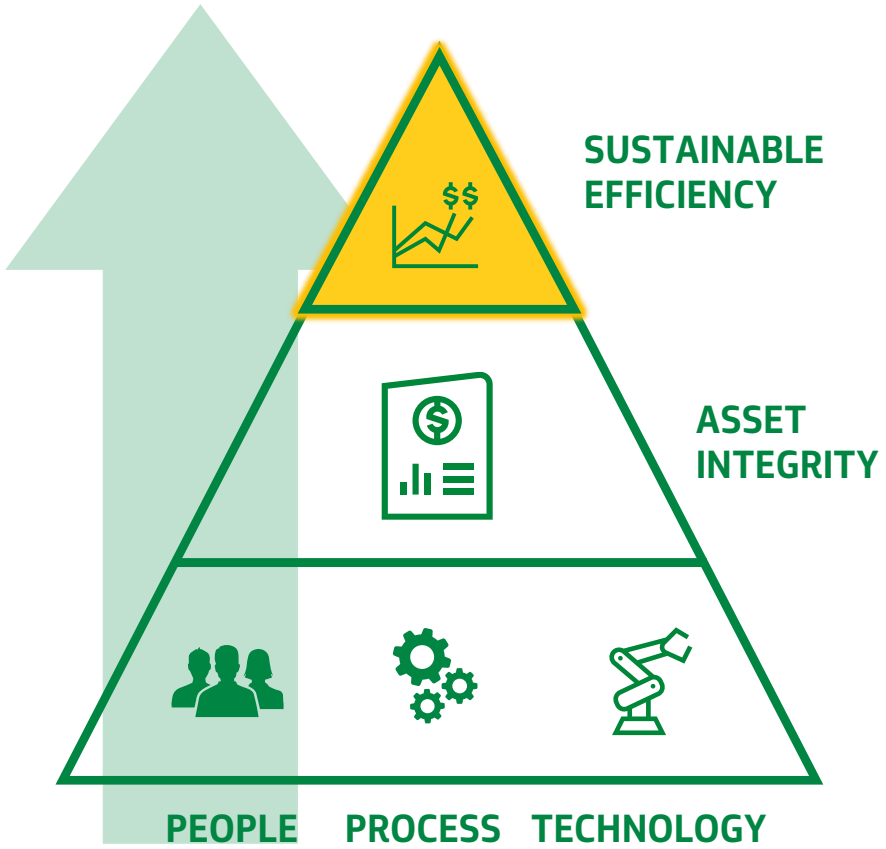
23 In decomissioning

SAFETY | ENVIRONMENT | REGULATORY COMPLIANCE | EFFICIENCY

And why is it so challenging?

Limited POB	Corrosive environment	Complex Logistics	Weather Shifts	Asset Complexity

Meanwhile, we have been able to gather positive results addressing integrity and efficiency



Together with our partners, we implement the **best industry practices**, in order to improve our **operational efficiency.**

Advances in applied new technologies

Digital twins

Corrosion-resistant materials

3D plant walk-through

Drone inspections

One of many technology uses is the **Non-Intrusive Inspection (NII)**, that has ammounted to substantial gains:

Reduction of more than 170,000 HHER

~ US$ 500 million between 2023-25

Marlim and Campos Basin Revitalization Project was awarded with OTC 2024 Prize

"For the deployment of a wide set of new technologies for the successful revitalization of the Marlim Field and the entire deepwater Campos Basin, unlocking new paths for mature deepwater asset redevelopment, with significant reduction in greenhouse gas emissions."

Marlim and other Campos Basin fields

2 new FPSOs in 2023 (150 kbpd - oil)

55% reduction of scope 1 greenhouse gas emissions CO_2

11 new wells already in production, connected to both Marlim's FPSOs

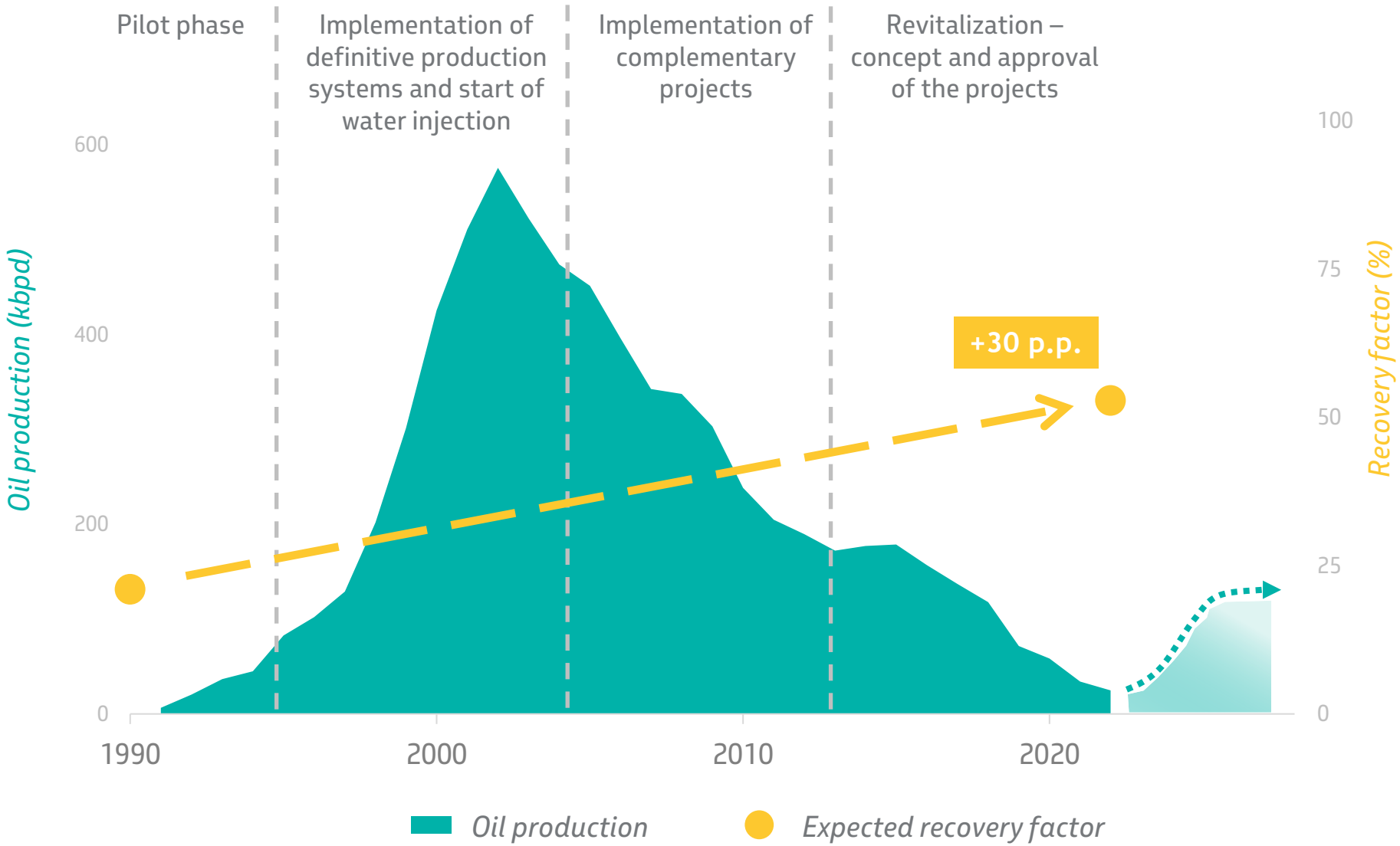
48 new wells interconnected to existing stationary production units

OTC Distinguished Achievement Award

FPSO ANNA NERY AT MARLIM FIELD

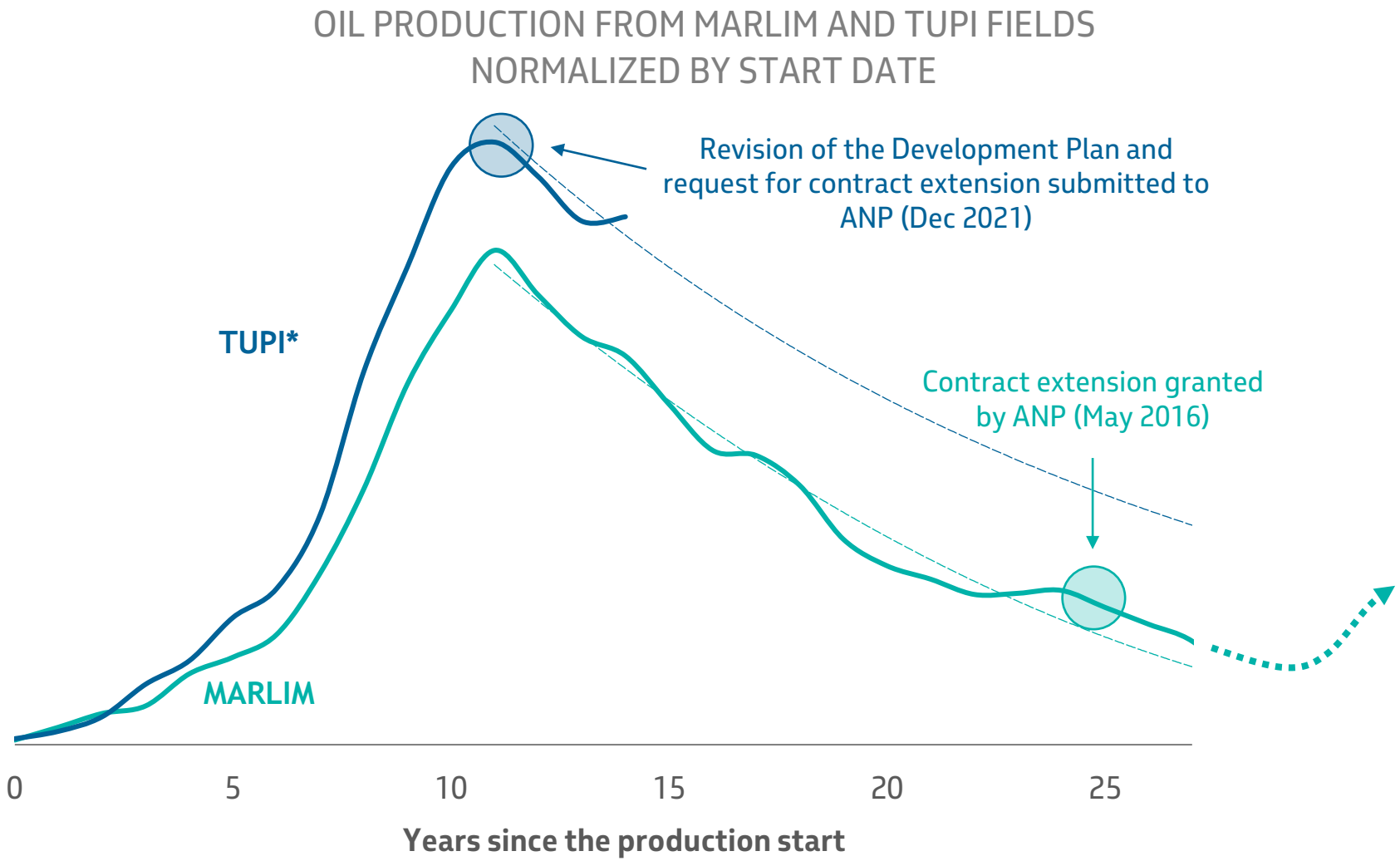
FPSO ANITA GARIBALDI AT MARLIM FIELD

We already have a long track record facing decline in the Marlim field, and the knowledge we obtained is helping us in other fields...



- *The continuous reservoir management actions and search for new opportunities reflect the effort to maximize the field value and to increase its recovery factor over the years*
- *Current cumulative recovery factor of around 40% with expectation to exceed 50% at the end of field's life*

...so lessons learned in the post-salt are very valuable when we focus on pre-salt giant fields

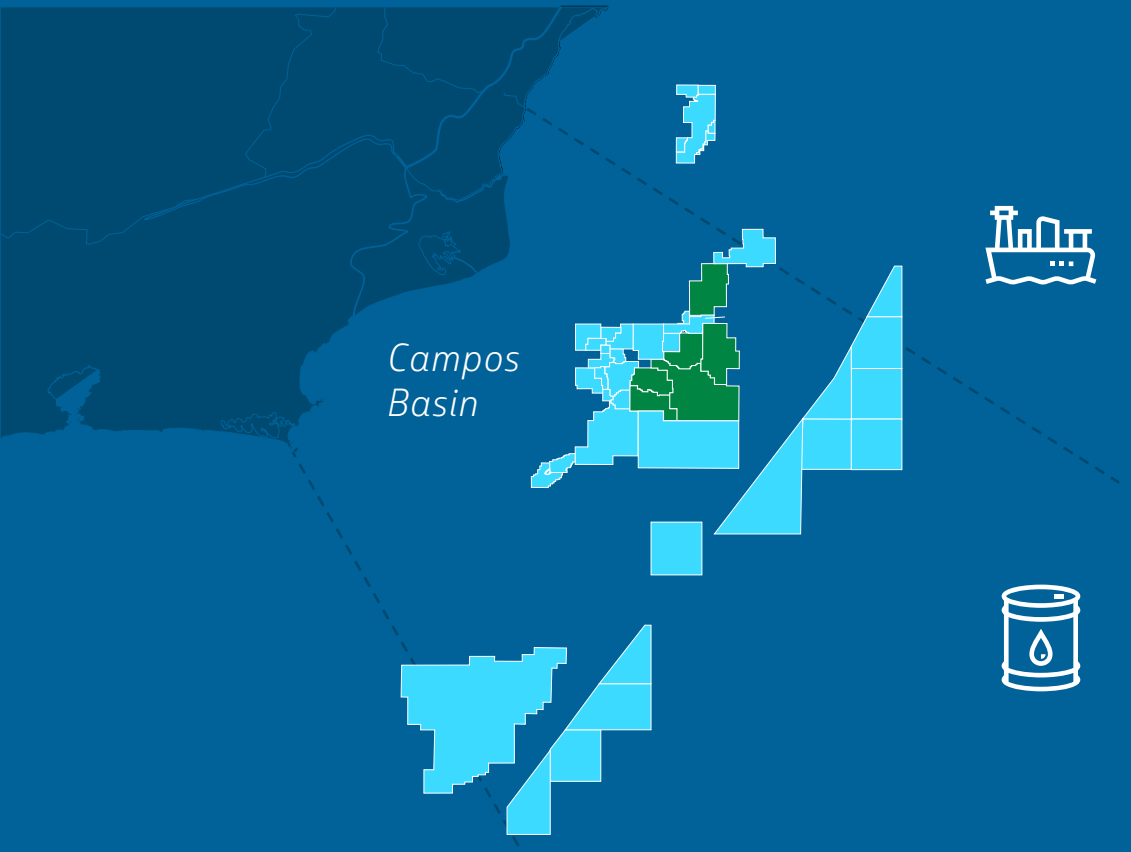


- *Similar ramp-up of about 10 years since production start until the peak of field production*
- *Historical production annual decline of ~10% in Marlim*
- *Even with a higher reservoir complexity, our expectation is to obtain annual decline rates lower than 10% in Tupi due to several initiatives, such as:*
  - *Water alternating Gas injection (WAG)*
  - *Intensive use of Inflow Control Valves (ICVs)*
  - *Higher operational efficiency*
  - *Earlier discussions on contract extension enabling additional complementary and revitalization projects*

* Shared Reservoir of Tupi only (excludes Iracema Area)

Campos Basin remains a pioneer in E&P, with 4 new units by 2028

New projects increase production, as well as economic and environmental resilience of Campos Basin assets



4 new production units Jubarte, Albacora (Revit), Barracuda-Caratinga (Revit) and Raia Manta/ Raia Pintada

40% of the basin's production in 2028 will come from the presalt

200 new wells to connect in 5 years

US$ 22 billion of capex in projects

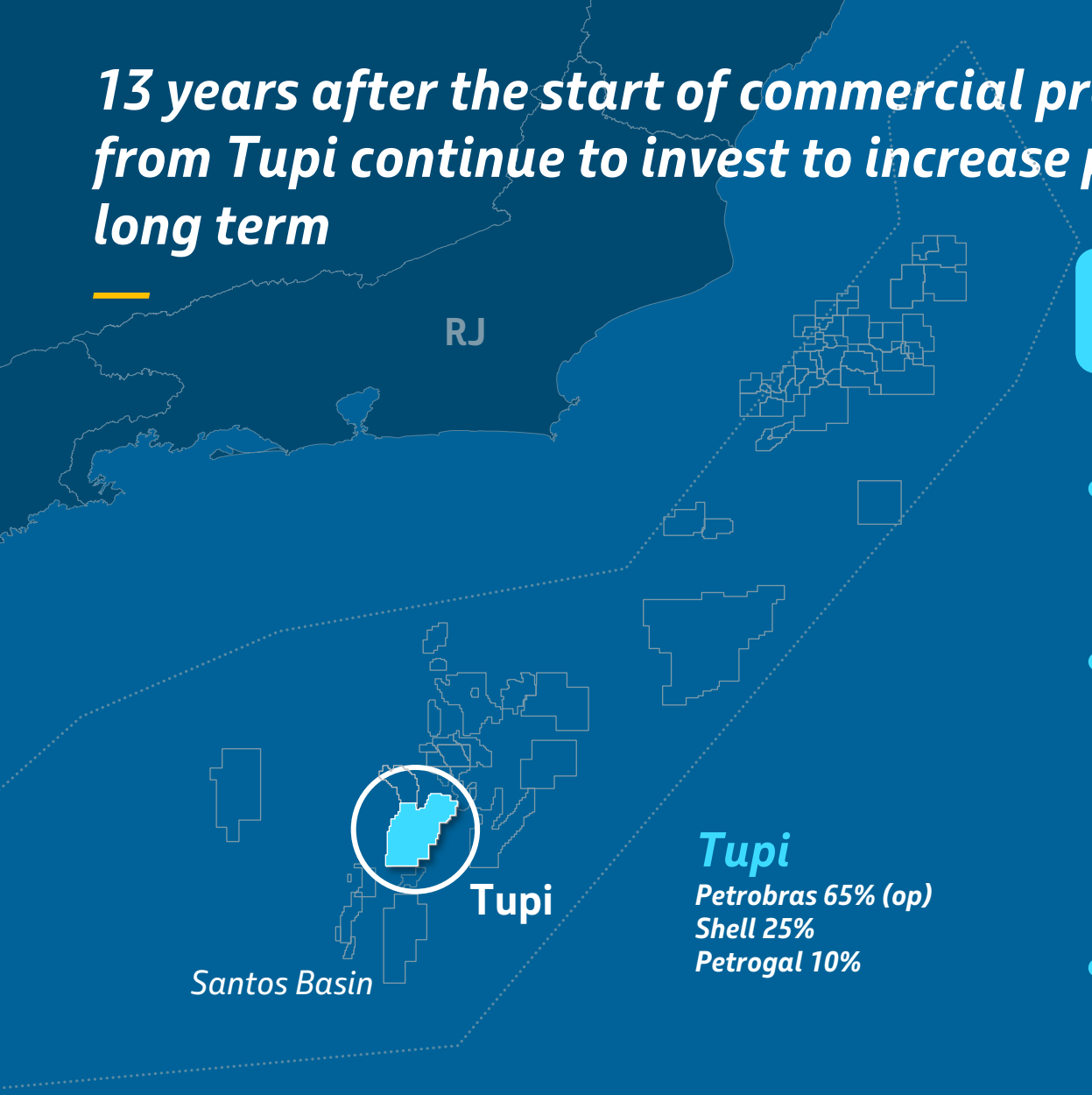
40% reduction in lifting costs (vs. 2023)

We will reduce around **10 kgCO_2e/boe** in our emissions until 2028, a **35% reduction comparing to** 2022

*Campos Basin's first revitalization, in the **Marlim field**, replaced 9 units with 2 new platforms and will reach peak production with **130 kboed***

17 decommissioned units by 2028

13 years after the start of commercial production, Petrobras and partners from Tupi continue to invest to increase production in the short, medium and long term



Tupi
Petrobras 65% (op)
Shell 25%
Petrogal 10%

TUPI

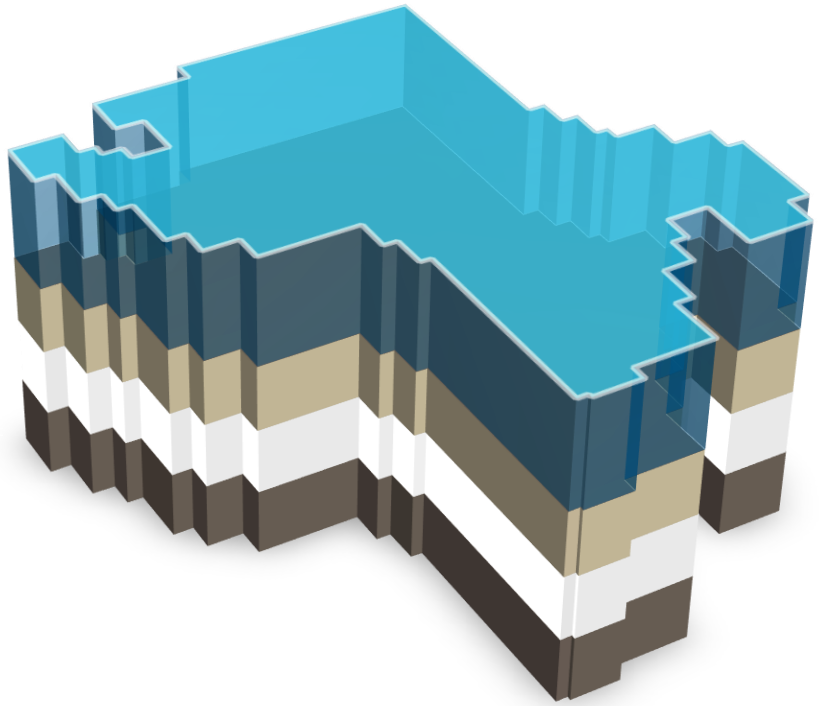
Complementary projects + initiatives to increase the recovery factor of the field

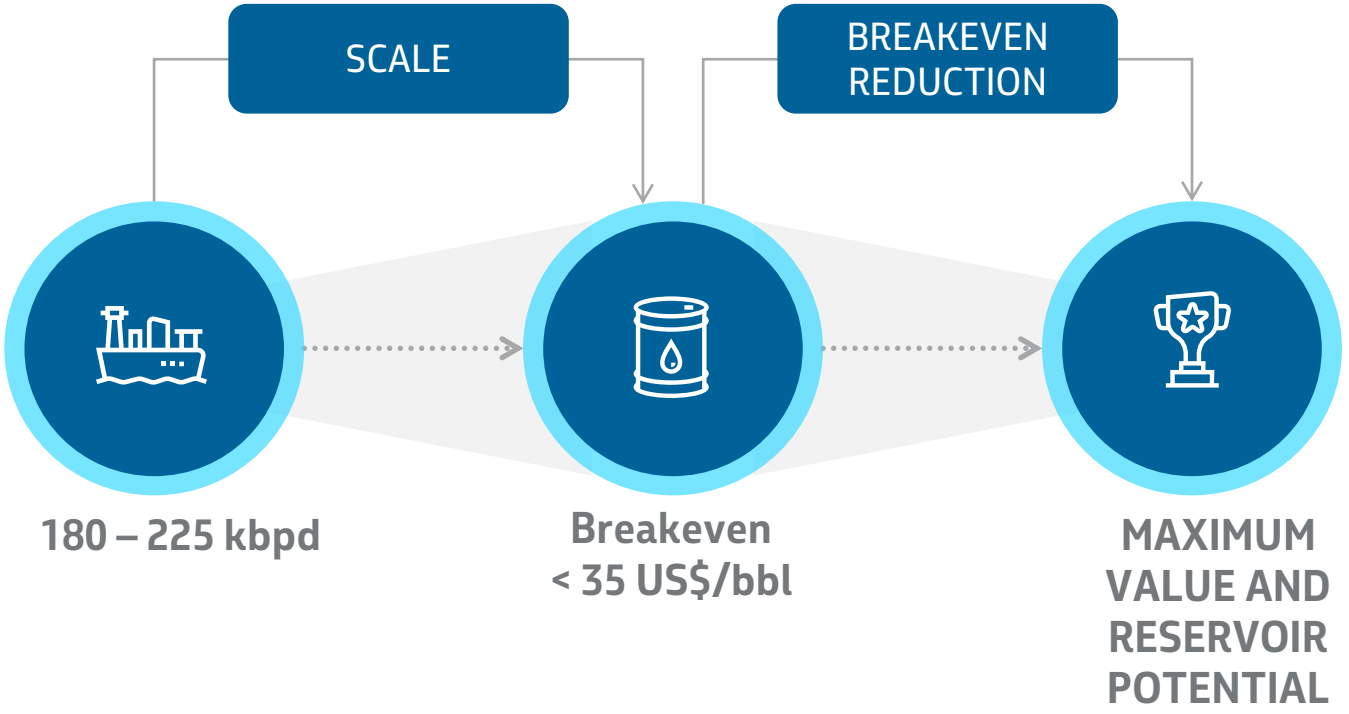
3D OBN Seismic Acquisition for better characterization of reservoirs (largest carried out in the world)

Integrated Development Plan:

- New DP submitted in 2021 for evaluation by the ANP (concession extension from 2037 to 2064)
- Lifetime extension of owned FPSOs
- Revitalization Project: production system including new unit (REVIT1 of Tupi)

Búzios is a supergiant field with great oil quality, substantial reserves and low emissions, that will continue to deliver great results in the near future





BÚZIOS DEVELOPMENT PLAN HIGHLIGHTS

1.5 MM
boed at peak production (2029)

37%
of Petrobras Oil Production (2028)

FPSO Sepetiba: in operation since December 31st in Mero 2 region

MAIN OPTIMIZATION SOLUTIONS

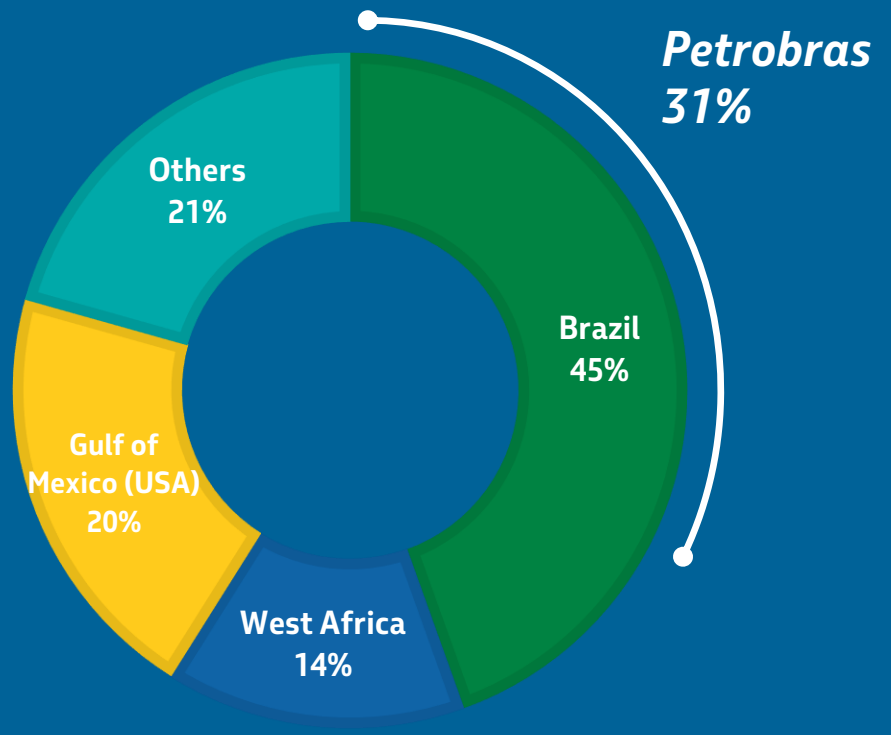
We are using several cutting-edge technologies in the platform that have allowed us to implement important optimization solutions.

Reduction of 56% of power demand and 12% weight in affected systems (comparing to previous Mero's FPSOs).

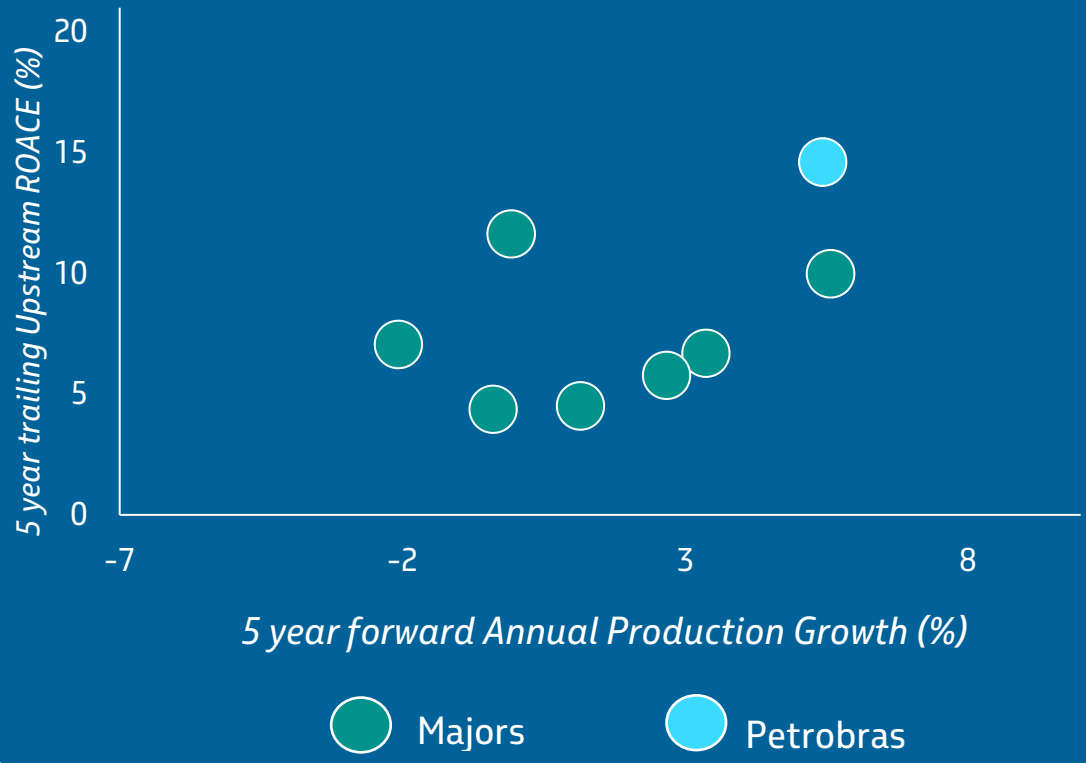
FPSO Sepetiba:
Production capacity: Oil 180 kbpd / Gas 12 MM m³/d

We are Global Leaders in Deepwaters with a good track record on Capital Efficiency

WE ARE LEADING GLOBAL DEEPWATER OIL PRODUCTION - 2023



WITH EXCELLENT BENCHMARKS OF EFFICIENCY AND GROWTH



Source: S&P Upstream Company Analytics

We are constantly increasing efforts to reduce GHG emissions

OPERATING ASSETS

Methane Emissions

- Flare management improvements
- Fugitive Emissions Monitoring

Energy Efficiency

- Turbogenerator optimization
- Compressors efficiency optimization
- Hybrid supply vessels

NEW PROJETCS

Main Concepts Applied

- All Eletric concept
- Combined Cycle
- Sea water dump line generator
- Zero routine flare and vent

Future Concepts

- External Power Source
- Post Combustion CCUS
- Ultra deep-water intake

And we are already being recognized internationally for our results

Petrobras reduced its methane emissions in the E&P and Natural Gas segment by **60%** (2015 a 2022)

UN environment programme

OGMP 2.0 GOLD STANDARD PATHWAY

Reinjecting
10.6 million tons of CO2
into pre-salt reservoirs

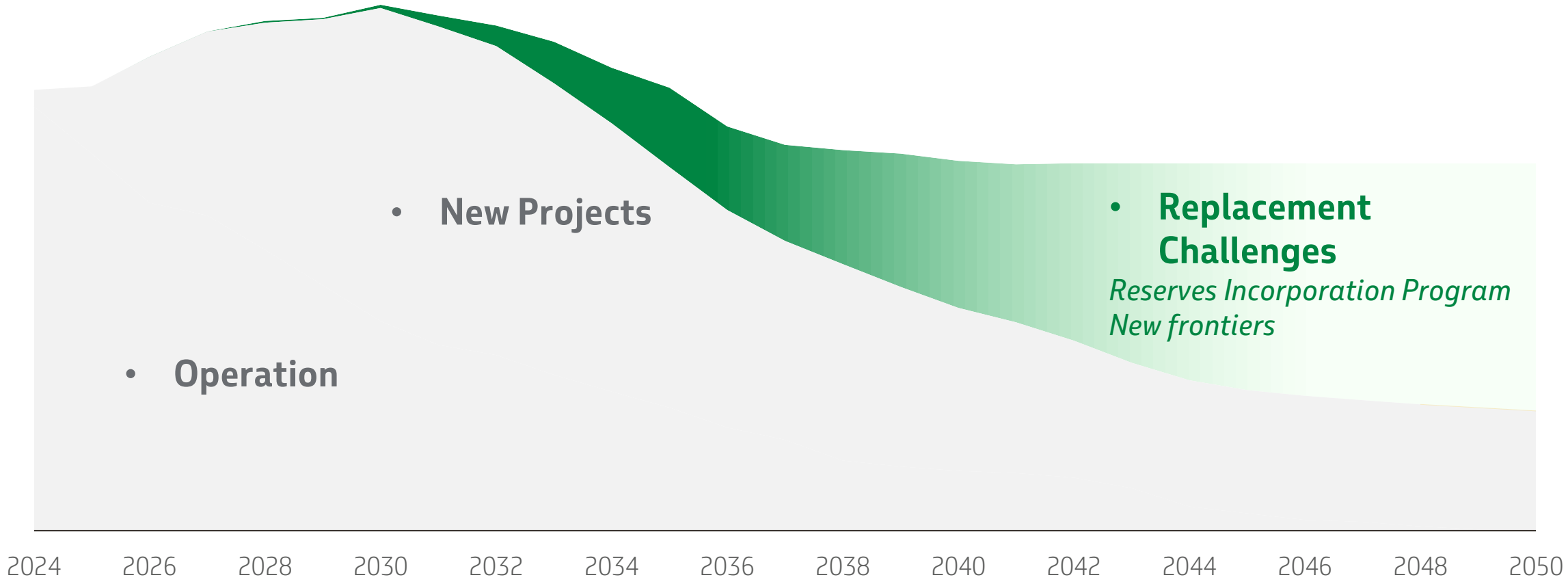
25% of the reinjections of the global industry in 2022

carbon sequestration leadership forum

CARBON SEQUESTRATION LEADERSHIP FORUM

Unprecedented recognition granted for the contribution to the development of CO_2 capture and storage (CCUS) technology

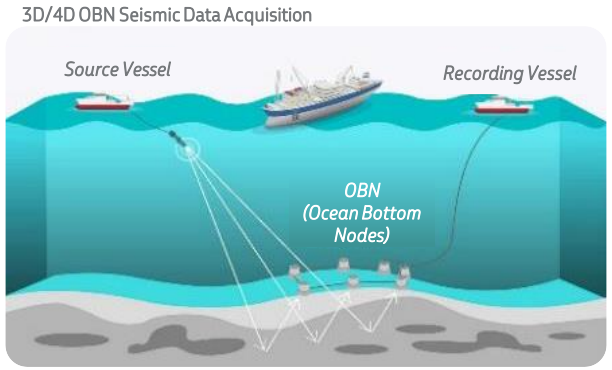
We have several replacement challenges that will be focused on profitability and in synergy with the Energy Transition



We are maximizing the value of our assets through an optimal proactive reservoir management combined with an endless search for new projects & opportunities...

RESERVES
INCORPORATION PROGRAM

3D/4D SEISMIC ACQUISITIONS



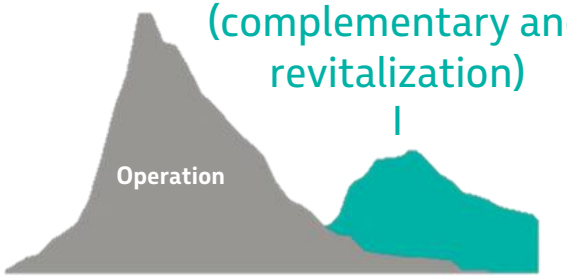
Investments of ~ US$ 4 billion in the 2024-28 timeframe

IMPROVED RESERVOIR MODELS

Use of advanced digital technologies for more reliable estimates

ASSET MASTER PLANS (continuously updated)

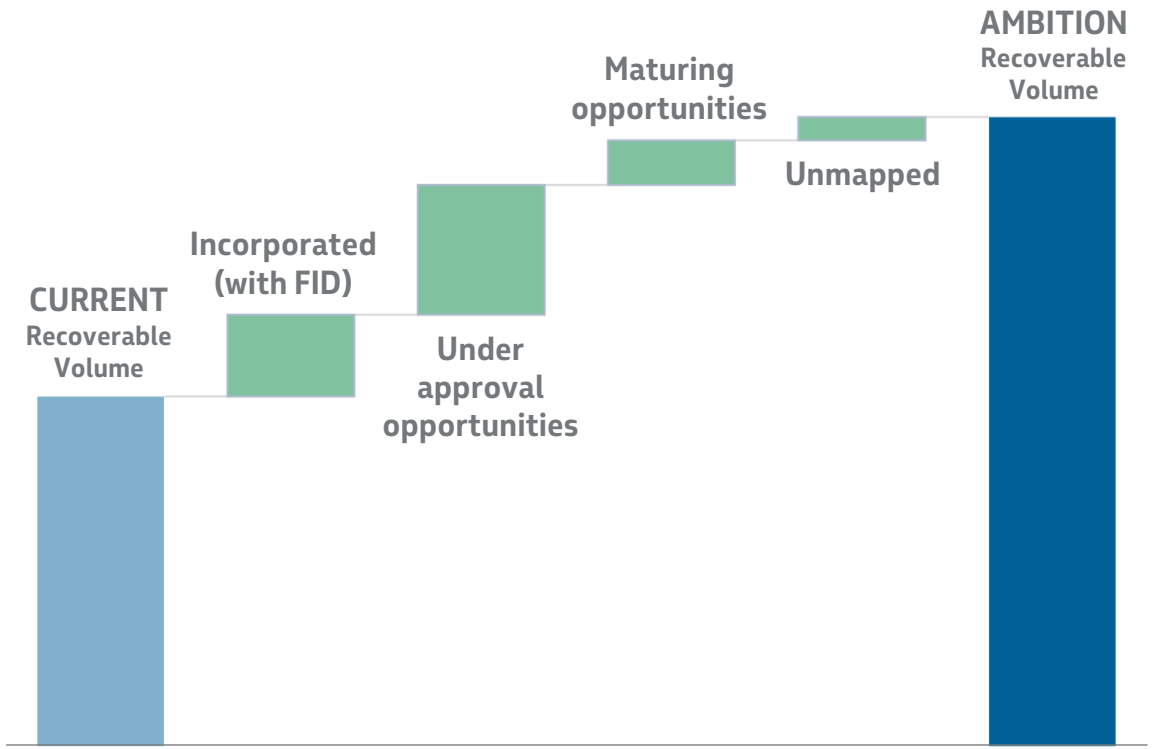
Reservoir management + new projects (complementary and revitalization)



Increased oil and gas recovery, improving the profitability of our assets

Our Reserves Incorporation Program is helping us to add volumes and to maximize the value of our assets

FOR EACH ASSET



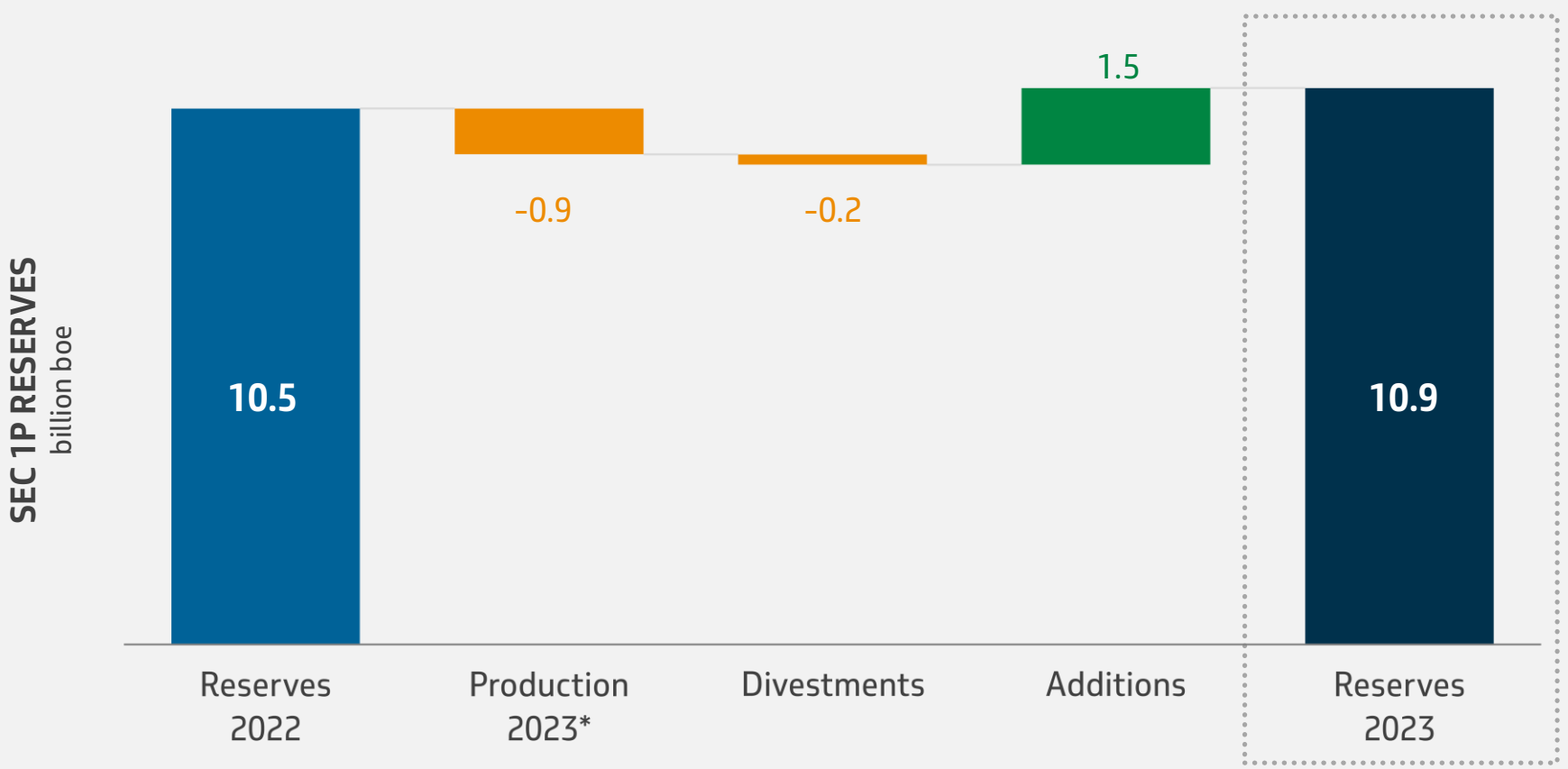
*Setting the **ambition** reserves for each asset based on reservoir benchmark studies with world class analogues*

***Mapping** new opportunities (optimized proactive reservoir management and new projects/ initiatives) to incorporate new volumes and increase the asset value*

*Increasing the technical/economical/ technological **maturity** to make each new opportunity viable*

***Approving** each new opportunity in Petrobras' and JVs' governances (FID) and hence incorporating additional reserves towards the ambition volumes*

Petrobras has been keeping its consistent track of good results and incorporated 1.5 bi boe of SEC 1P Reserves in 2023

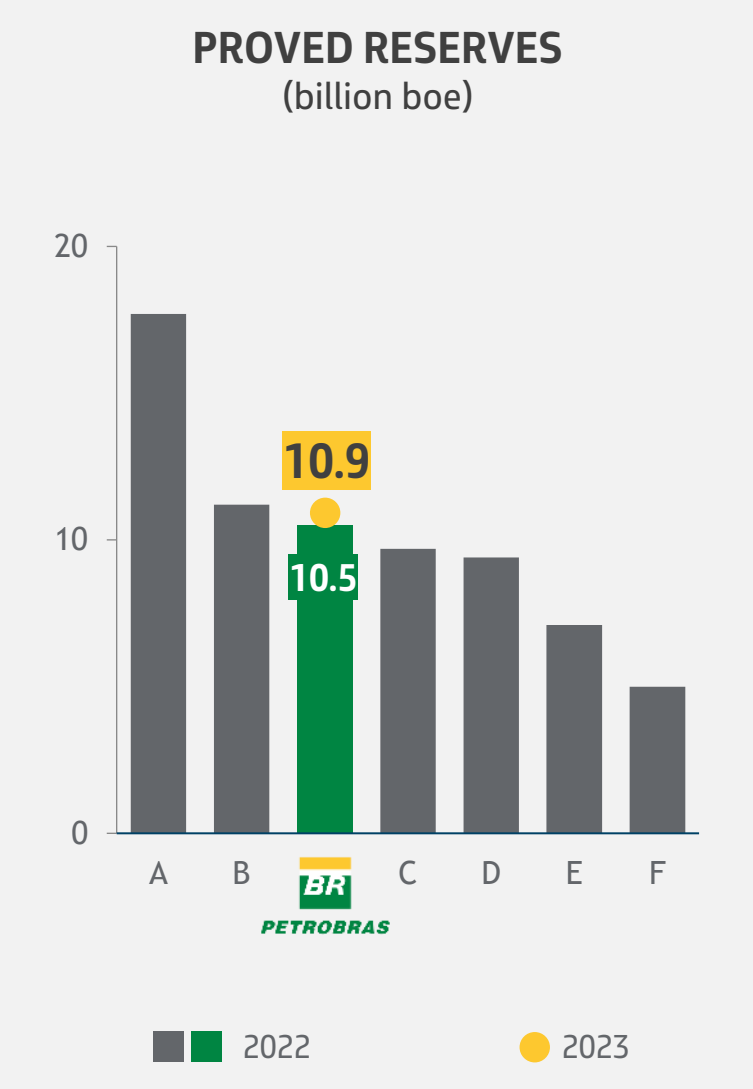


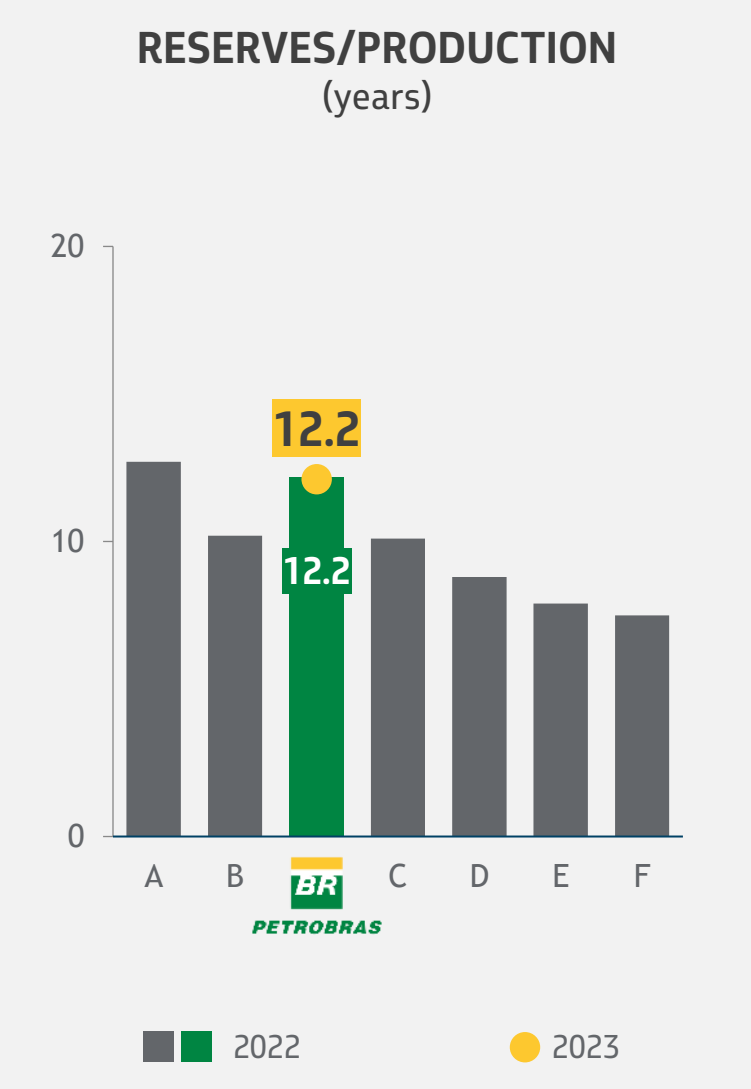
2023
Organic Reserve Replacement Ratio
168%

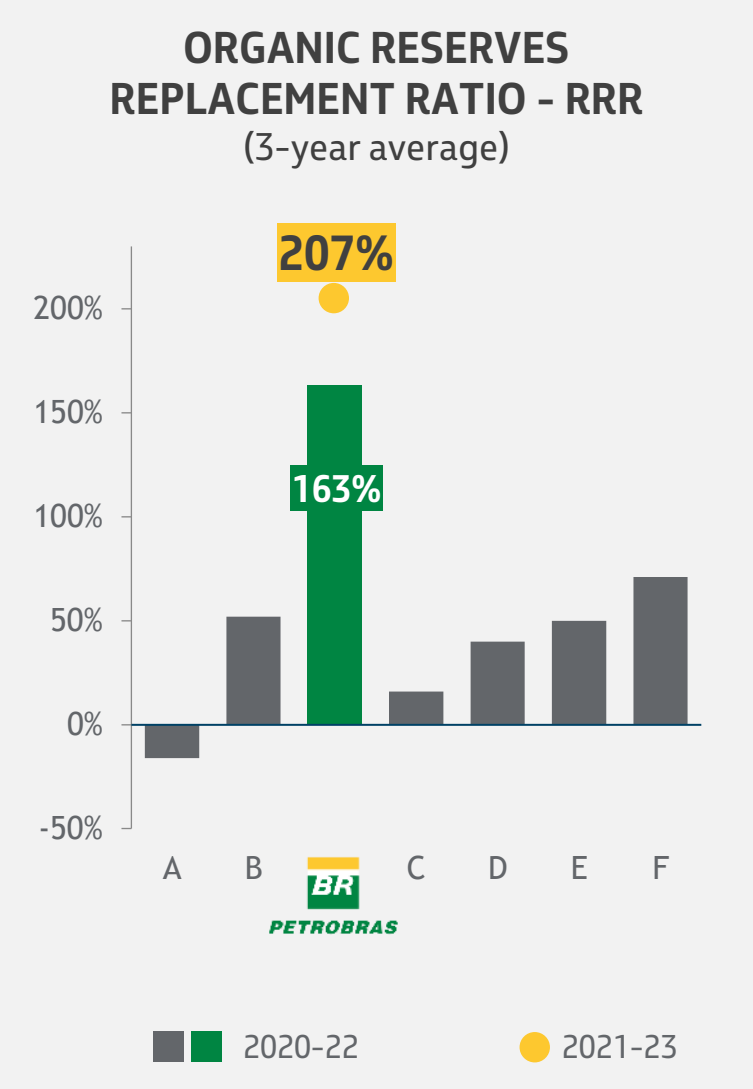
- Good performance of relevant assets, especially Búzios, Tupi and Atapu
- Declaration of commerciality of Raia Manta and Raia Pintada fields (BM-C-33 block)
- New complementary projects' FID in Campos Basin

* Does not consider: (a) natural gas liquids, since the reserve is estimated at a reference point prior to gas processing, except in the United States and Argentina; (b) volumes of injected gas; (c) production from extended well tests in exploration blocks; and (d) production in Bolivia, since the Bolivian Constitution does not allow the registration of reserves by the Company.

We are well positioned compared to majors







Source: Evaluate Energy
Major companies considered: BP, Chevron, Equinor, ExxonMobil, Shell and TotalEnergies

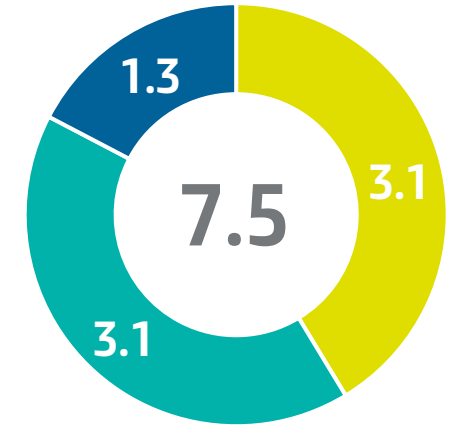
We will invest US$7.5 billion in Exploration in our current portfolio seeking to replace reserves through new frontiers

EXPLORATION FOCUS

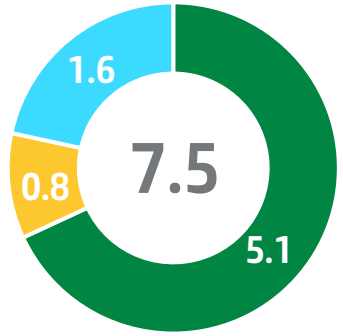
Exploring new oil and gas frontiers, seeking new generation of fields in synergy with the energy transition

EXPLORATION CAPEX

US$ billion

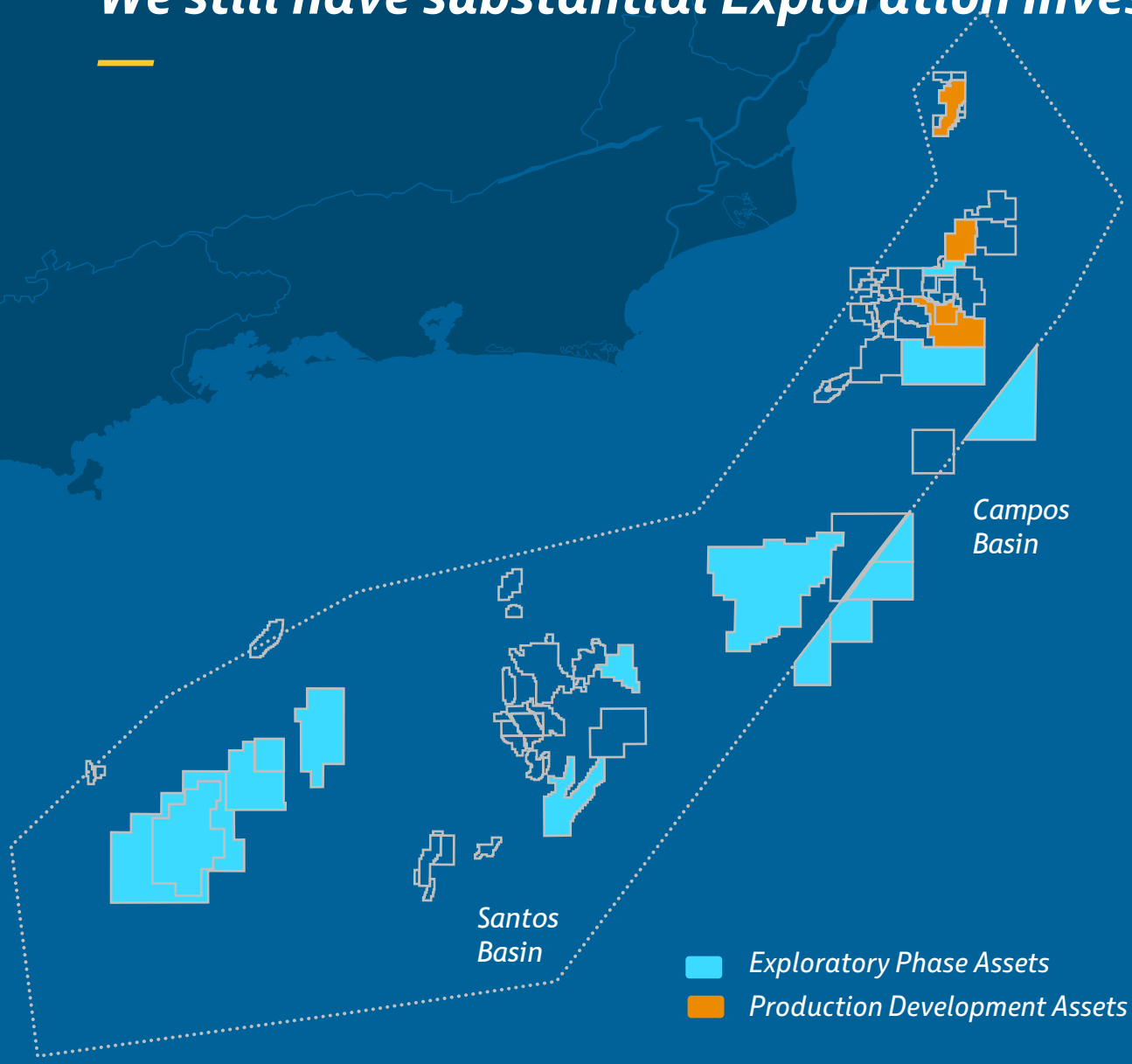


Southeast Basins (41.4%)
Equatorial Margin (41.5%)
Other countries (17.1%)



Wells (68.1%)
Geophysical Acquisition and Processing (10.3%)
Other (21.6%)

We still have substantial Exploration Investments in the Pre-salt

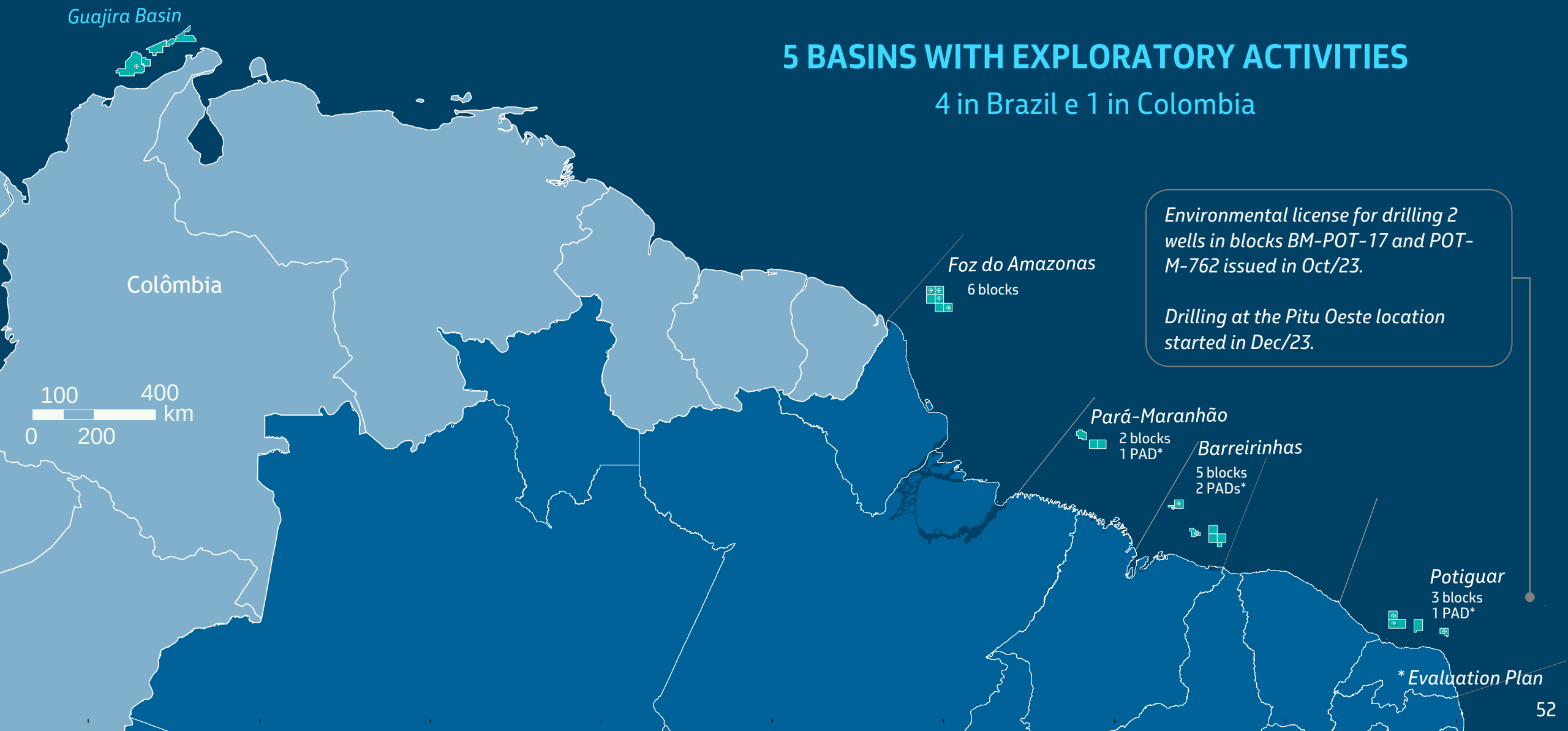


EXPLORATORY ASSETS IN PRESALT

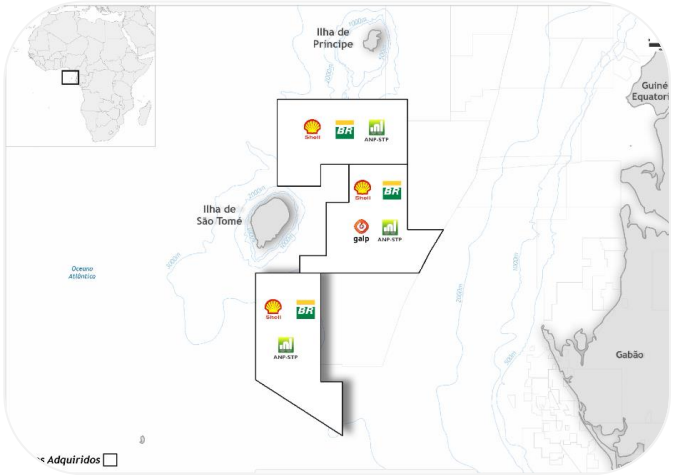
- *Almost 18,000 km² of available area*
- *Capex: US$ 2.4 Bi (Presalt Fields)*
- *22 Exploratory Wells (2024-2028)**

In addition to these, there is another well in the Espírito Santo basin with a geological objective in the pre-salt, which makes up the informed investment.

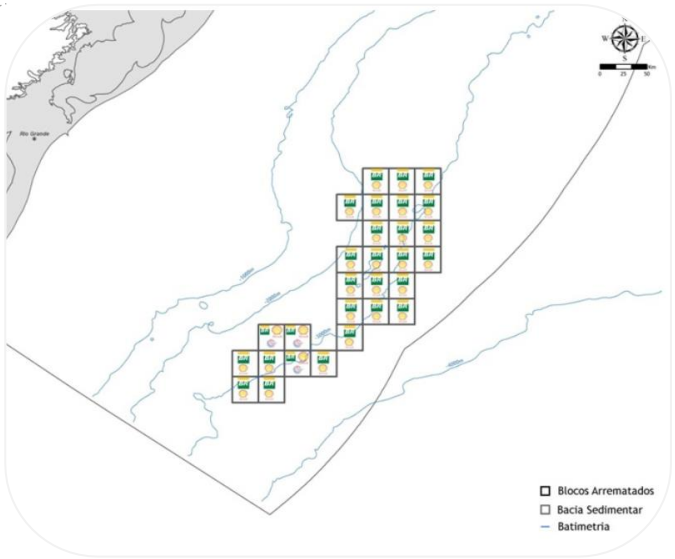
Equatorial Margin: by 2028 we expect to drill 16 wells in Brazil and 6 in Colombia



In line with the reserve replacement strategy and focus on the Atlantic, we acquired stakes in 3 blocks on the west coast of Africa and 29 in the Pelotas basin



Acquisition of 3 exploration blocks in São Tomé and Príncipe, west coast of Africa, in partnership with Shell (3) and Galp (1)



Acquisition of 29 exploration blocks in the Pelotas Basin in partnership with Shell (29) and CNOOC (3)

Petrobras seeks excellence focusing its Upstream segment not only on a profitable and sustainable portfolio, but also on looking for new opportunities

We are established **worldwide leaders** in **Deepwater** Exploration and Production

We established a **consistently accurate methodology** for our Production Curve Forecasts

We are ready to obtain **maximum value** from our current assets through an **Optimal Proactive Reservoir Management** and an endless search for **New Projects & Opportunities**

We have a remarkable **low cost/low emissions portfolio** and we are already working on **new frontiers** with a focus on the Atlantic Basins

We keep working **focused in HSE** applying the best practices in industry, constantly improving procedures, technologies, hazard control, projects, risk analysis and also training our teams

DEEP DIVE PETROBRAS 2024

E&P Q&A session

DEEP DIVE

PETROBRAS *2024*

—

Engineering, Technology and Innovation

Carlos Travassos

PETROBRAS

DEEP DIVE
PETROBRAS 2024

Exploration & Production

Challenges and initiatives related to the implementation of major Upstream projects

PETROBRAS

Substantial project portfolio over the next 5 years supports production growth

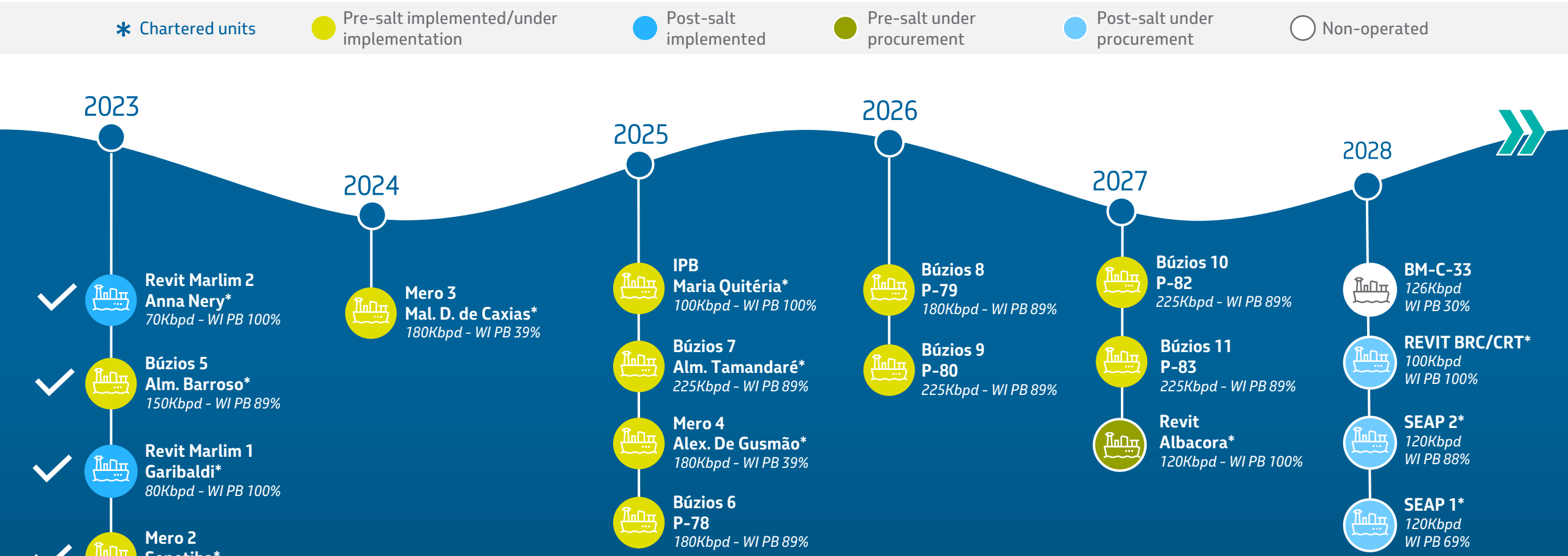
14
New FPSOS

> 140
Complementary projects

>350
Offshore production development wells

~ 8,000
Km of pipelines to be launched

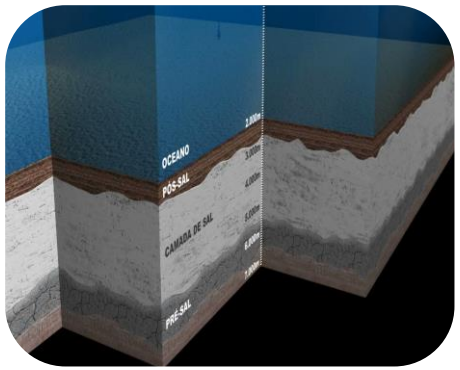
We will add 14 FPSOs in the 2024-2028 period, 10 of which already contracted

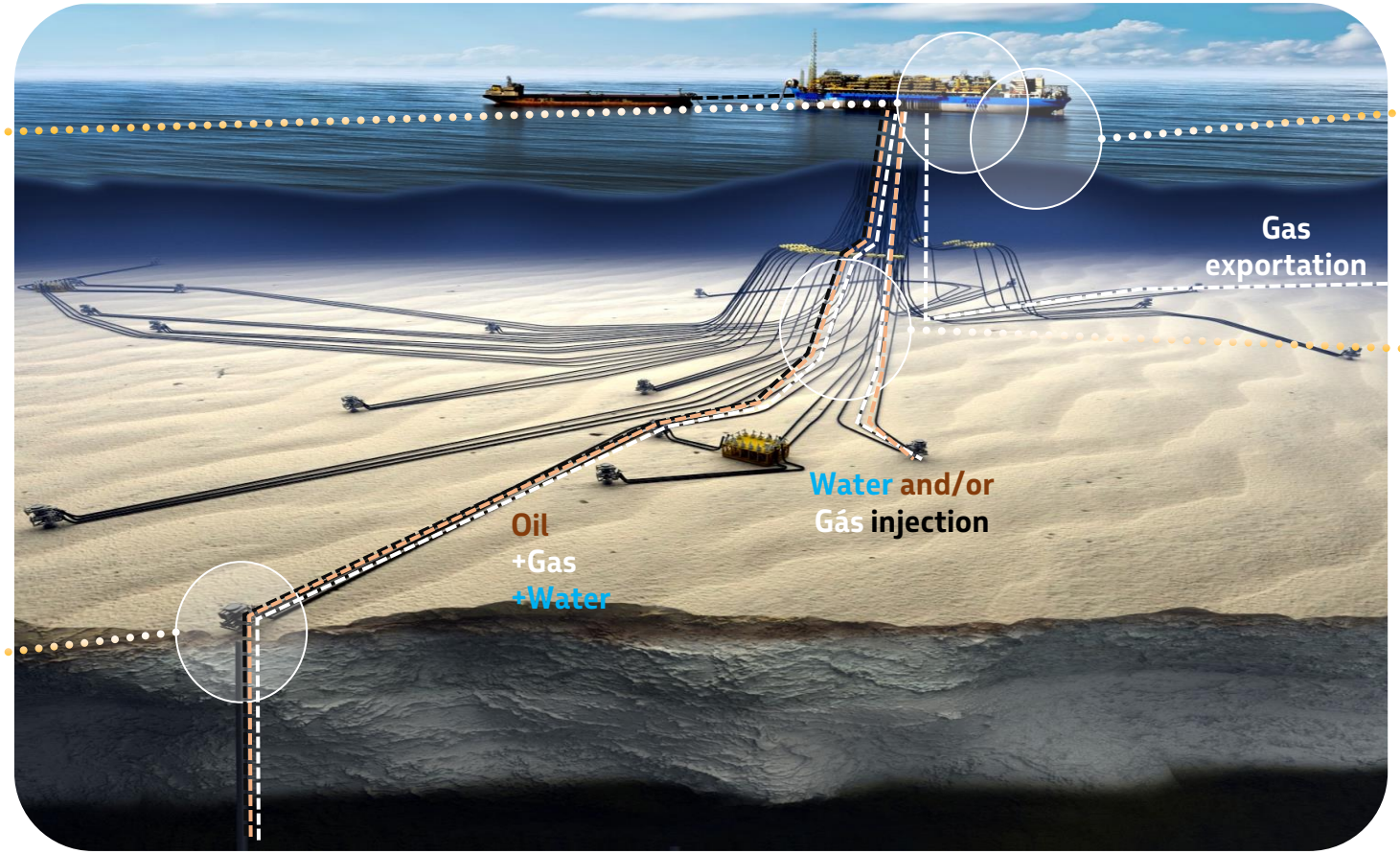


Typical Petrobras Offshore Production Development Project

Procurement → FPSO construction → Mooring → Connections

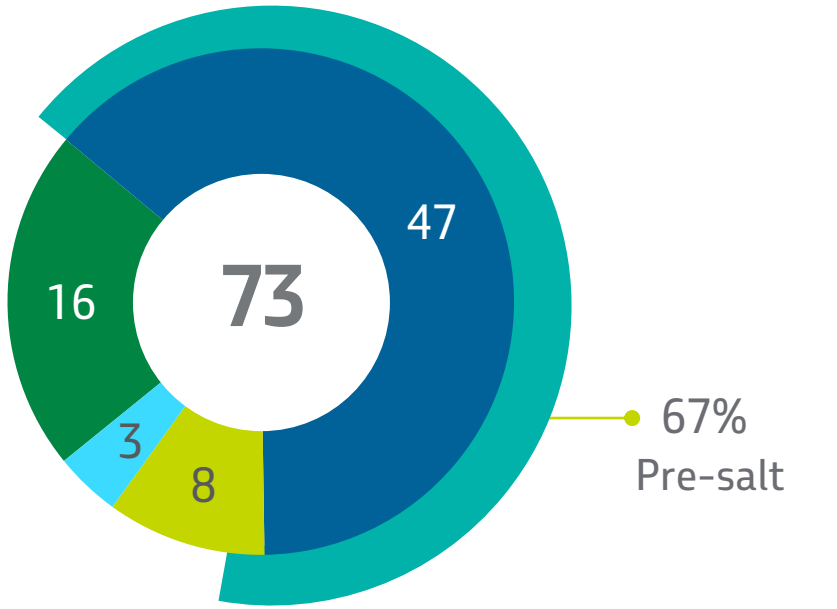
FEL 2 — *FEL 3* — Wells construction — *1st oil*





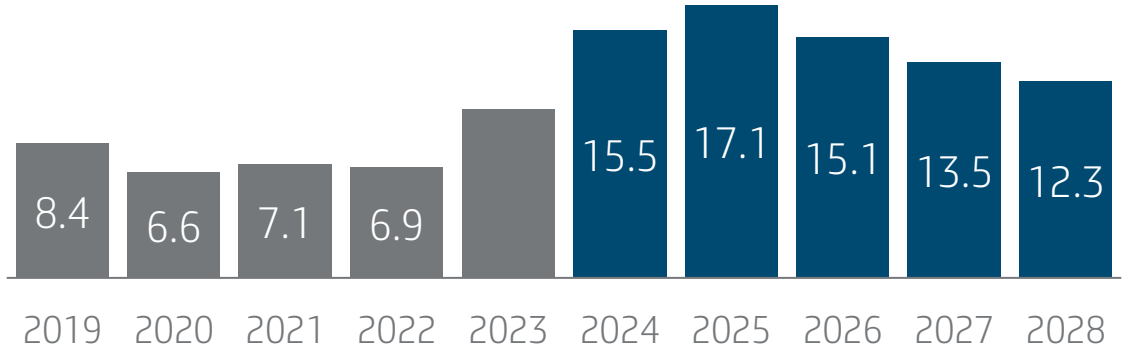
We present an increasing investment level with a significant committed percentage

E&P CAPEX 2024–28
US$ Billion



Post-salt Exploration Pre-salt Others

ANNUAL E&P CAPEX
US$ Billion



**2023 CAPEX is in final calculation*

92% 82% 70% 51% 43%

% committed per year

Projects with greater maturity and, consequently, greater value committed in contracts, present lower execution risk.

CAPEX curve incorporates portfolio risk analysis

Our CAPEX curve includes the portfolio risk analysis

INPUTS

Deterministic capex per main resource

Rig, PLSV, FPSO and other

RISK MODELING AND SIMULATION

SUPPLY RISKS

- Schedule vessels under construction
- Schedule vessels under contract

DEMAND RISKS

- Project risks
- Estimation of durations
- FPSO Handover

HISTORICAL INVESTMENT ACHIEVEMENT INDEX

EXCHANGE RATE

iterations

OUTPUT

OF MODEL CAPEX RISK TUNNEL

Our procurements happen in a more challenging context

- End of lockdowns
- Ukraine war
- Inflation + interest
- Imbalance in supply chains
- Energy security
- Market fundamentals
- Cost escalation and resource constraints

PETROBRAS ANSWERS

- Supply Market Partnerships
- Search for efficiency
- Technological innovations

We identified the main reasons for underachievement of investment in 2023 and actions to minimize deviations in 2024

TOPSIDE SYSTEMS

- ***Force majeure***
- ***Measurement criteria***

SUBMARINE SYSTEMS

- ***Availability of Subsea Material***

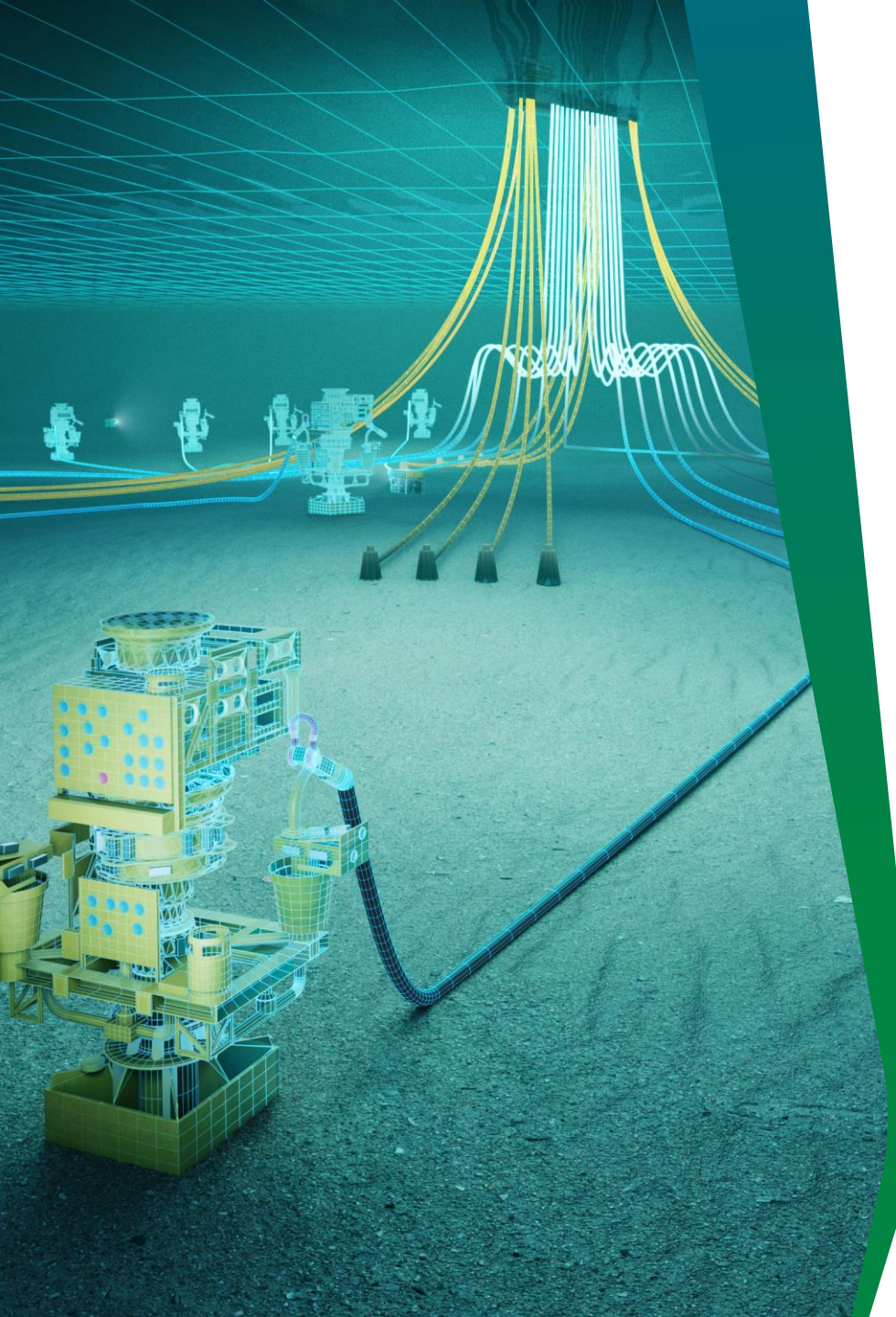
  Improvement in the dimensioning process
- ***Line changes due to corrosion phenomenon (SCC-CO_2)***

  Revised planning based on performance history

WELLS

- ***Rigs availability***

  Revised planning premise seeking greater adherence to realized



And we keep monitoring other risks to assure investment predictability

MAIN RISKS

TOPSIDE ▶ ▶ ▶ Market capacity constraint

SUBSEA ▶ ▶ ▶ Contracting of lines and subsea equipments

WELLS ▶ ▶ ▶ More complex management due to increasing of the rig fleet

Several initiatives seek to guarantee successful contracting of our next FPSOs

Purpose of promoting the competitiveness and attractiveness of contracting processes through actions involving optimization of FPSO projects and improvement of contracting processes

Mapping attractiveness constraint factors

Structuring action plans focused on factors

- Projects optimization
- Review of Engineering Guidelines and Criteria
- Standardization
- Financiability / Cash Flow
- Improvements in the contracting terms

FPSO Alm. Barroso

Platform type selection methodology is based on value generation for Petrobras

The comparison of alternatives must consider the aspects of deadlines, expenses and production

Comparison between the alternatives

Activities schedule | Investment | Operational cost

Operational efficiency | Production capacity

Risk analysis for comparing alternatives

The analyses incorporates the uncertainties associated with the parameters used in the comparison, including a qualitative risk analysis about supplier market capacity

Aim: Balance of Petrobras and supplier capacity

Initiatives to assure availability of subsea equipment are critical to successful project execution

INITIATIVES AIMING TO GUARANTEE THE SUPPLY OF CRITICAL COMPONENTS AND SERVICES OF SUBSEA SYSTEMS THROUGHOUT THE ENTIRE LIFE CYCLE OF PRODUCTION FIELDS.

Strategy and Planning	Integrated Planning, in “Real Time” Probabilistic Based Demand Analysis
Supply Chain Management	“Market Intelligence” Development of New Suppliers
Engineering and Standardization	Standardization of Subsea Lines and Equipment Maximization of the use of Digital Tools
Inventory Management	Inventory Optimization Reutilization of Flexible Pipelines

Initiatives to improve rig availability address challenges in a changing market context

CHANGE IN THE SUPPLIER'S MARKET CONTEXT

Rig's Market Intelligence

STRATEGY

Go to the market at the proper timing

CONTRACTING

Prior analysis of companies' technical capacity

PREDICTABILITY

Expected rig start-up time based on recent events (heated market)

CAMPAIGN PLAN MAXIMIZING THE USE OF RESOURCES

Broader rigs specifications to ensure greater flexibility to comply with the portfolio

DIMENSIONING

Optimal fleet cost maximizing project value

We are delivering our goals and continue with the trend of increasing efficiency

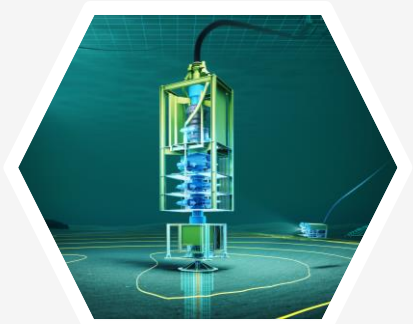
More active on risk factors

Increasingly stronger integration between disciplines

Commitment to goals with a direct impact on the remuneration of project teams

NEW SYSTEMS

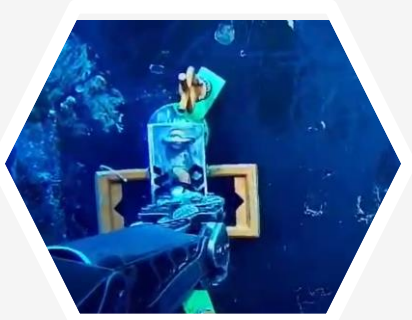
- Delivered 5 systems in 12 months



- 52 wells built, 57 well connected and 650 km of lines launched in 2023 with increased efficiency

MAINTENANCE AND ABANDONMENT

resource sharing



Hull inspection

- ~3.500 inspections of lines and ~1.350 of hulls and 36 wells workovers
- 29 wells abandoned and ~1.100 km of lines collected in 2023

DEEP DIVE
PETROBRAS 2024

Exploration & Production

Innovation with focus on business needs and challenges

PETROBRAS

CENPES

Research, Development and Innovation Center

Research Center totally integrated with business

Technological innovation has been the basis for Petrobras' pioneering spirit over 70 years and will drive the construction of the future

US$3.6 billion in R&DI from 2024 to 2028

Increase participation in decarbonization and new energy to 30% in 2028

HIGH CAPACITY FOR INNOVATION

Human Capital
- **948** Researchers

Partnerships
- **+9 k** Researchers engaged
- **+230** Innovation partners
- **+50** Startups

Total Area
- **308 k** m²

- **116** Laboratories
- **4,600** Equipment

Technologies protected by active patents **+1,200**

Patents filed

2021	2022	2023
119	128	143

National Record
of patents filed for the third consecutive year[1]

11% can impact decarbonization and new energies

[1] to be confirmed by the National Institute of Industrial Property (INPI)

Innovation to create opportunities to business

1992 — Technical achievements related to the development of deepwater production systems in Marlim field (Campos Basin)

2001 — Advances in technologies and cost effectiveness in deepwater development projects of Roncador field (Campos Basin)

2015 — Set of technologies developed for oil and gas production in the pre-salt layer

2019 — Set of innovations developed in the Libra Long Term Test (TLD), in the Santos Basin pre-salt.

2020 — Set of innovations developed to enable production in the Búzios field, in the Santos Basin pre-salt

2023 — For the development of a new technological solution “BOP anchoring technology and real-time riser analysis”, that allows to reduce greenhouse gas emissions and increase operational efficiency

2024 — Deployment of a wide set of new technologies for the successful revitalization of the Marlim Field and the entire deepwater Campos Basin, unlocking new paths for mature deepwater asset redevelopment, with significant reduction in greenhouse gas emissions in pre-salt

Awarded

7 TIMES

by OTC

Highest award of the world’s oil industry

OFFSHORE TECHNOLOGY CONFERENCE ®

OTC International *OTC Brazil*

Innovations in the revitalization of the Campos Basin awarded by OTC

Recognized innovation by relevant awards in 2023

Carbon Sequestration Leadership Forum

Unprecedented recognition granted for the contribution to the development of CO_2 capture and storage (CCUS) technology

ANP Innovation Prize
Government regulatory agency

*Winners of **4** out of **5** categories*

Valor Inovação Prize
Press

***1st** place Oil and Gas* ***2nd** place General*

MIT Technology Review
Press

Among the 20 most innovative companies in Brazil

Ranking 100 Open Startups
Top Open Corps

***1st** place Oil and Gas* ***12th** place General*

76

Connections for innovation

Open innovation hub based on technological challenges with several channels for the presentation of proposals

Startups
TRL and CRL acceleration
+50 engaged startups

Pre-Commercial Procurement
Develop and scale-up Technologies
+20 on progress

Tech Transfer
Share to get value
+30 contracts

Residents
Attract professionals and accelerate the learning curve
12 residents

Tech Partnerships
Share Challenges and find best partners
+800 partnerships
9.000 researches

Solutions Acquisition
Accelerate Adoption
8 startups

Open Labs
Open code software development

For more information: https://tecnologia.petrobras.com.br

Topics that are the focus of Petrobras' RD&I Portfolio

1 Integrity and Reliability of E&P Assets

2 Decommissioning of E&P Assets

3 Future Geology for Improving Predictability

4 Production and Injection Efficiency in E&P Assets

5 Sustainable Geophysics in New Frontiers and Reserve Reposition

- environmental oriented seismic source
- autonomous and low-cost seismic receiver
- access to exploratory new frontiers
- support reserves reposition in reservoir projects
- future geophysical technologies for O&G industry

6 Gas Efficiency and Competitiveness

- Availability of gas process plants
- Energy efficiency and operational excellence
- Gas monetization
- Rentability on gas commercialization
- Decarbonization of gas operations

7 Refining Asset Integrity and Efficiency (REFTOP)

8 SCC-CO_2

9 Safety

10 Environment

11 Integrated Production Management

12 Future Production systems

- Decarbonization of operations
- New energy sources
- Interventions without rigs
- Disruptive completion
- Subsea pumping and processing
- Future Surface Systems

13 Refining, Transportation and Trading of the Future

- Decarbonization of operations
- Products with higher value added
- Integration with petrochemicals
- Digitalization
- Operational efficiency and energy performance

14 Low Carbon Products

- Biofuels Technologies
- Green Chemistry in Refinind and Petrochemistry
- E-fuels and CO_2 conversion
- Renewable raw materials
- Performance and quality of renewable products

15 CCUS

- CCUS Hubs
- Bioenergy integrated into CCS (BECCS) and direct air capture (DAC)
- New technologies for more economical and efficient CO_2 capture
- Technologies for converting CO_2 into higher value-added products

16 Wind and Solar Generation

- Mapping wind potential
- Regional environmental characterization
- Competitiveness assessment and optimization of projects
- Connection to offshore E&P assets
- Conceptual design study

17 Low Carbon Hydrogen

- Geological hydrogen
- Sustainable hydrogen
- Sustainable H_2 storage, transport and distribution
- New uses of sustainable H_2 ammonia

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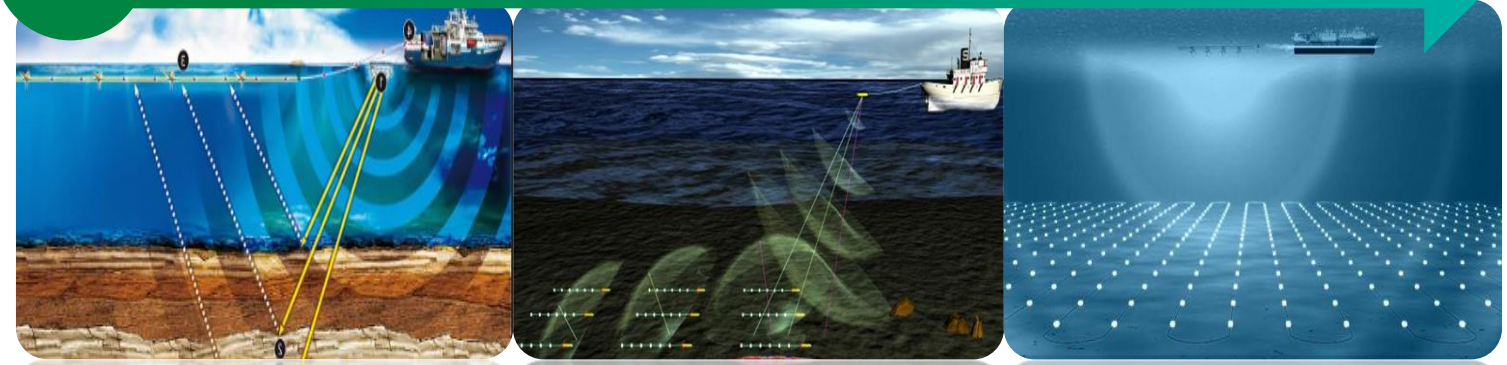
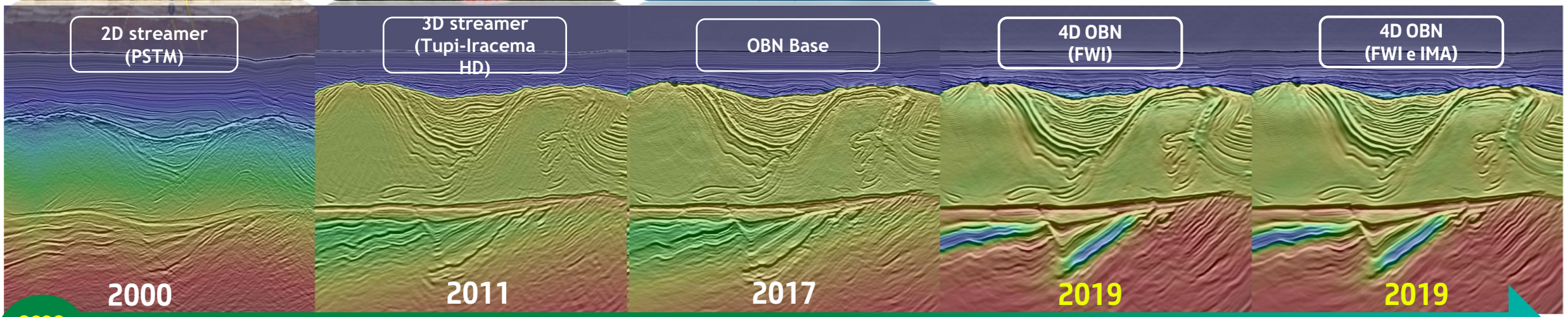
Petrobras Seismic Evolution

SEISMIC ACQUISITION TECHNOLOGY EVOLUTION





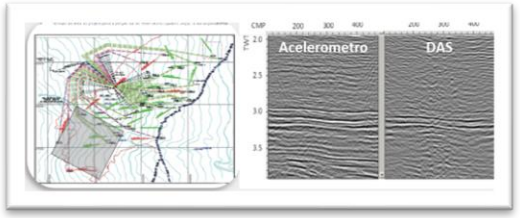
SEISMIC IMAGING EVOLUTION

New data reprocessing Technologies for OBN

**OBN: ocean bottom nodes*

Geophysical Technologies - New Frontiers & Sustainability

Technological Roadmap



New seismic processing algorithms

Autonomous vehicle for supporting semipermanent seismic acquisition and nodes (miniaturized seismic sensors)

2023 — **2027 +**

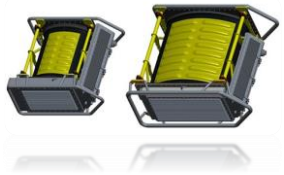
OD OBN (On Demand-Ocean Bottom Nodes) test - Cimatec Park

Semicommercial-scale manufacturing of OD-OBN

Miniaturization of the nodes

Field installation of OD-OBN in the Pre-salt

Marine vibratory source (partnership with ShearWater)



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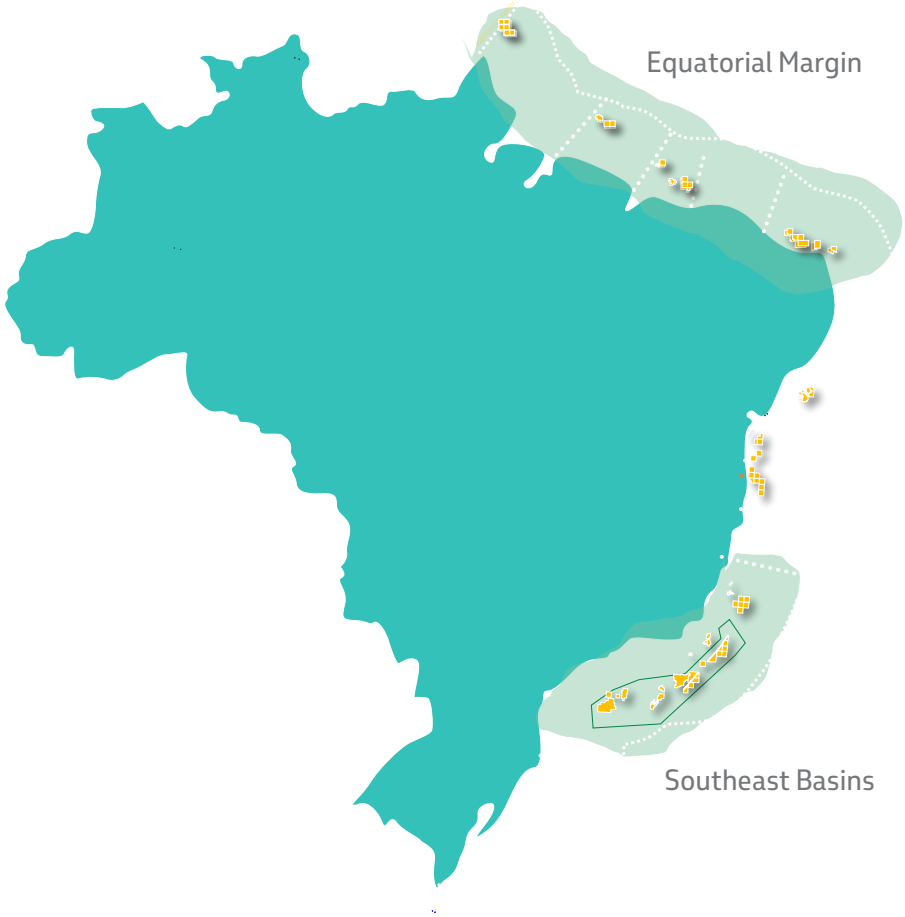
17 Low Carbon Hydrogen

Our Challenges for the Next Years



- New Production Frontiers
- CAPEX Resilience
- Complex Complementary Projects
- Improve Operations & Production Effiency
- Energy Transition & Decarbonization
- Risk Exposure Reduction
- Opportunities for Innovation

And we have a portfolio of innovations to generate value in a double resilience scenario

R&D PORTFOLIO – E&P

USD 2.3 billion
2024-2028

MAIN LINES

WELLS

- *Rig automation*
- *All electric well*
- *Disruptive well abandonment solutions*

SUBSEA SYSTEMS

- *Flexible pipelines for challenging conditions (new depth and pressure levels)*
- *Subsea processing, pumping, injection and storage systems*
- *Subsea electrification*

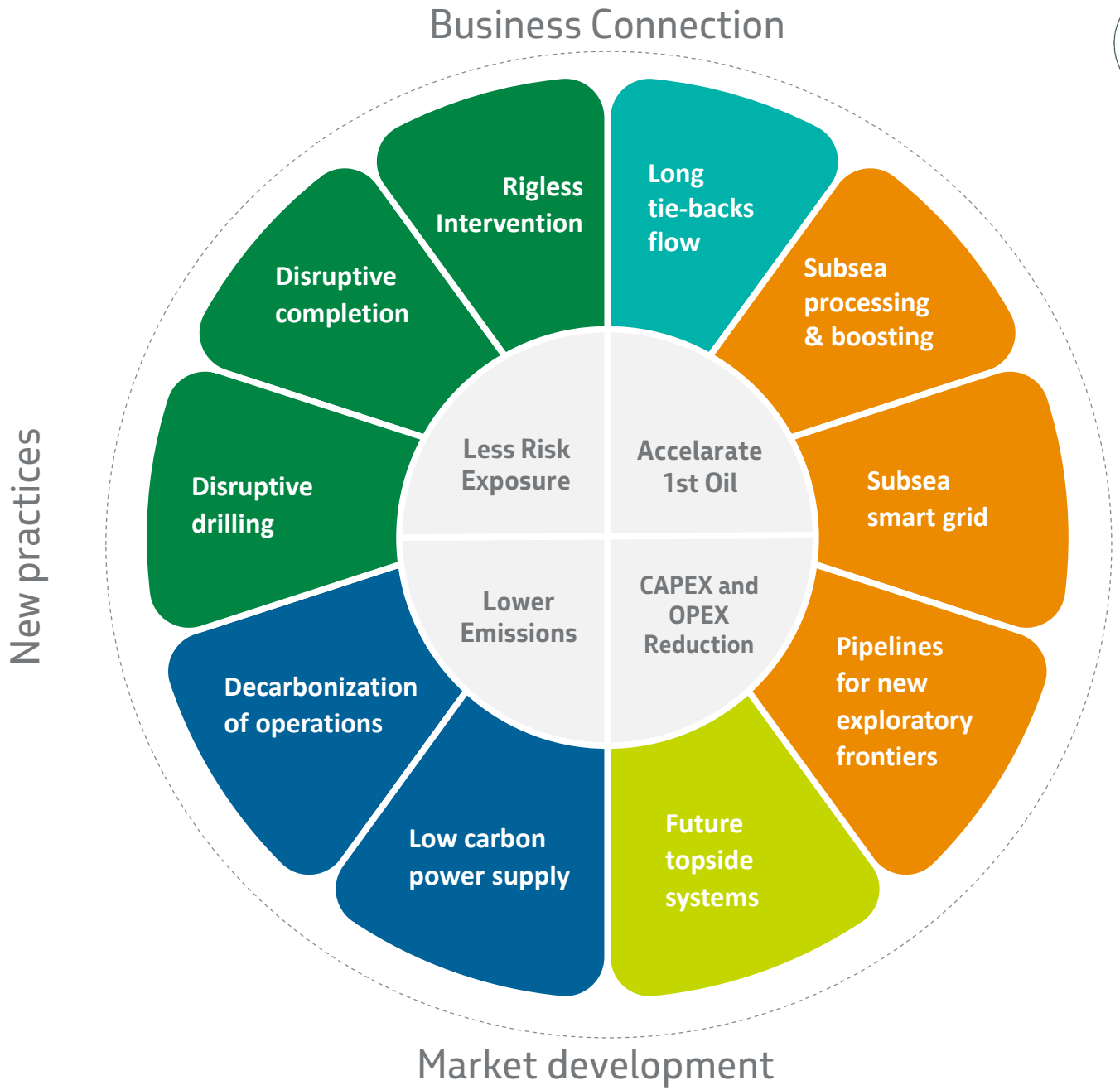
TOPSIDE SYSTEMS

- *Optimized FPSO, with low emissions and higher safety (energy imports)*
- *Technologies for decarbonization of operations*
- *Solutions for efficiency maximization and reduction of man-hours exposed to risk*

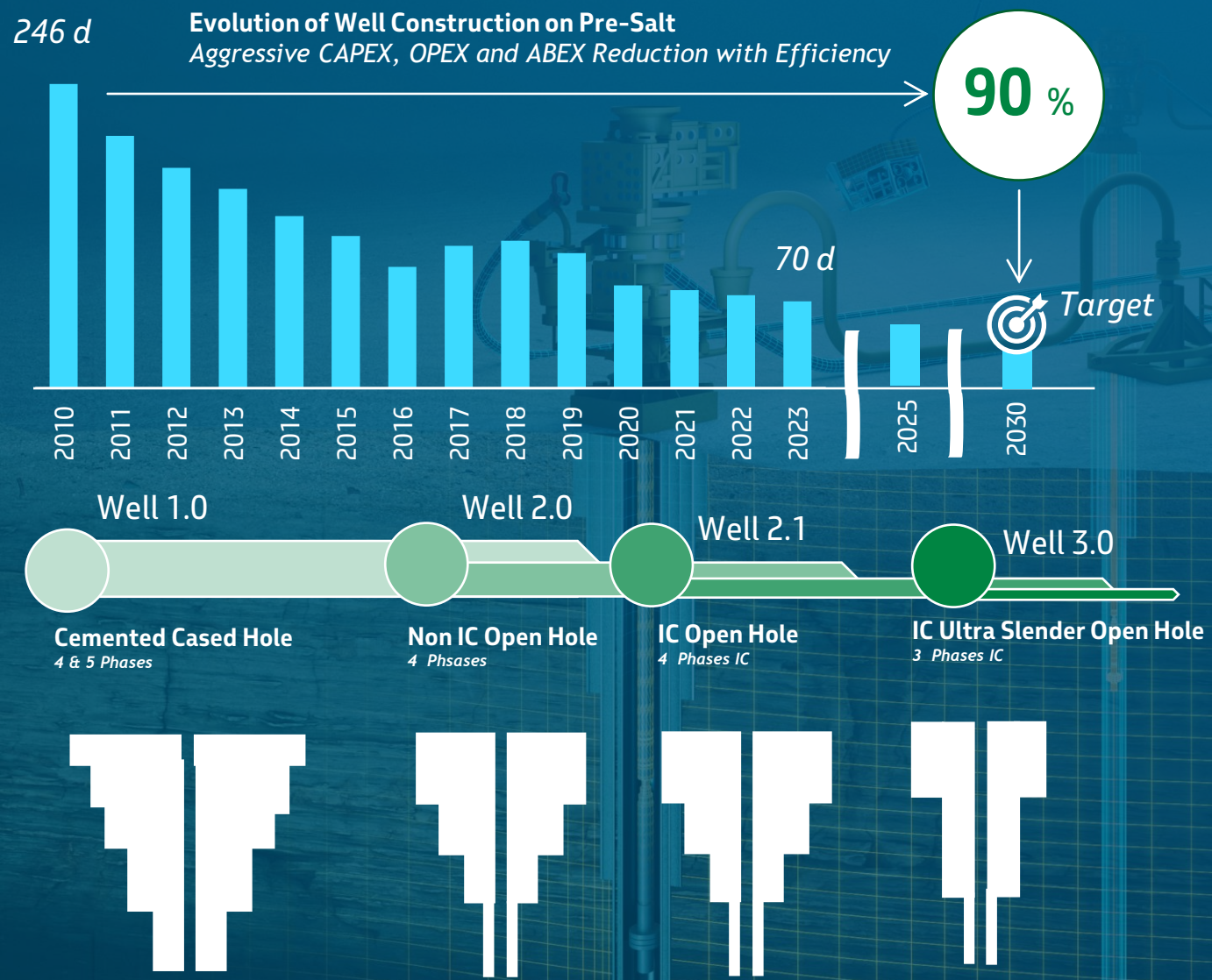
Production system of the future technological initiative

Technological Solutions by Portfolio

- *Flow Assurance*
- *Subsea*
- *Surface*
- *Energy and climate*
- *Wells*



Wells construction



ASSOCIATED TECHNOLOGIES

Aggressive CAPEX, OPEX and ABEX Reduction with Efficiency

Electrical Smart Completion

Increased production in reduced CAPEX design

TRL 6

High Reliability Equipment

Higher Reliability for Ultra Slender Wells

TRL 4 to 6

Well Intervention Robots

Reduction on workover costs

TRL 3

Self Abandoning Wells

Aggressively reducing P&A costs

TRL 2

Subsea Well Construction

Aggressive reduction of construction costs

TRL 1

TRL – Technology Readiness Level

Some Technologies and Enablers

FPSO
OF THE FUTURE

CCUS for exhaust gases

High Performance Membranes

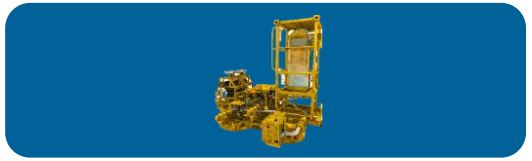
High Efficiency Equipment — Oil, Water, Gas, Compression, etc....

Low Carbon Power External Source

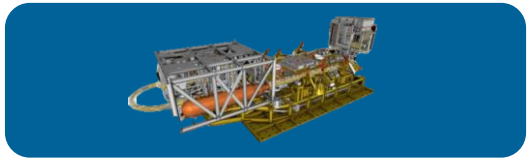
New Materials and Coatings

SINERGY WITH SUBSEA

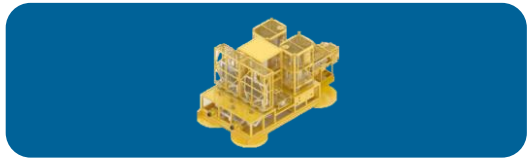
RWI & SDWI
Subsea Water Injection



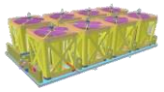
SSGL
Subsea Gas Liquid Separation



SSAO 3.0
Advanced Oil Water Separation



HISEP 2.0
Subsea High Pressure Gas Separation in Dense Phase



SCSI
Subsea Chemical Storage & Injection

Automated Pig Launcher

Electrical XT

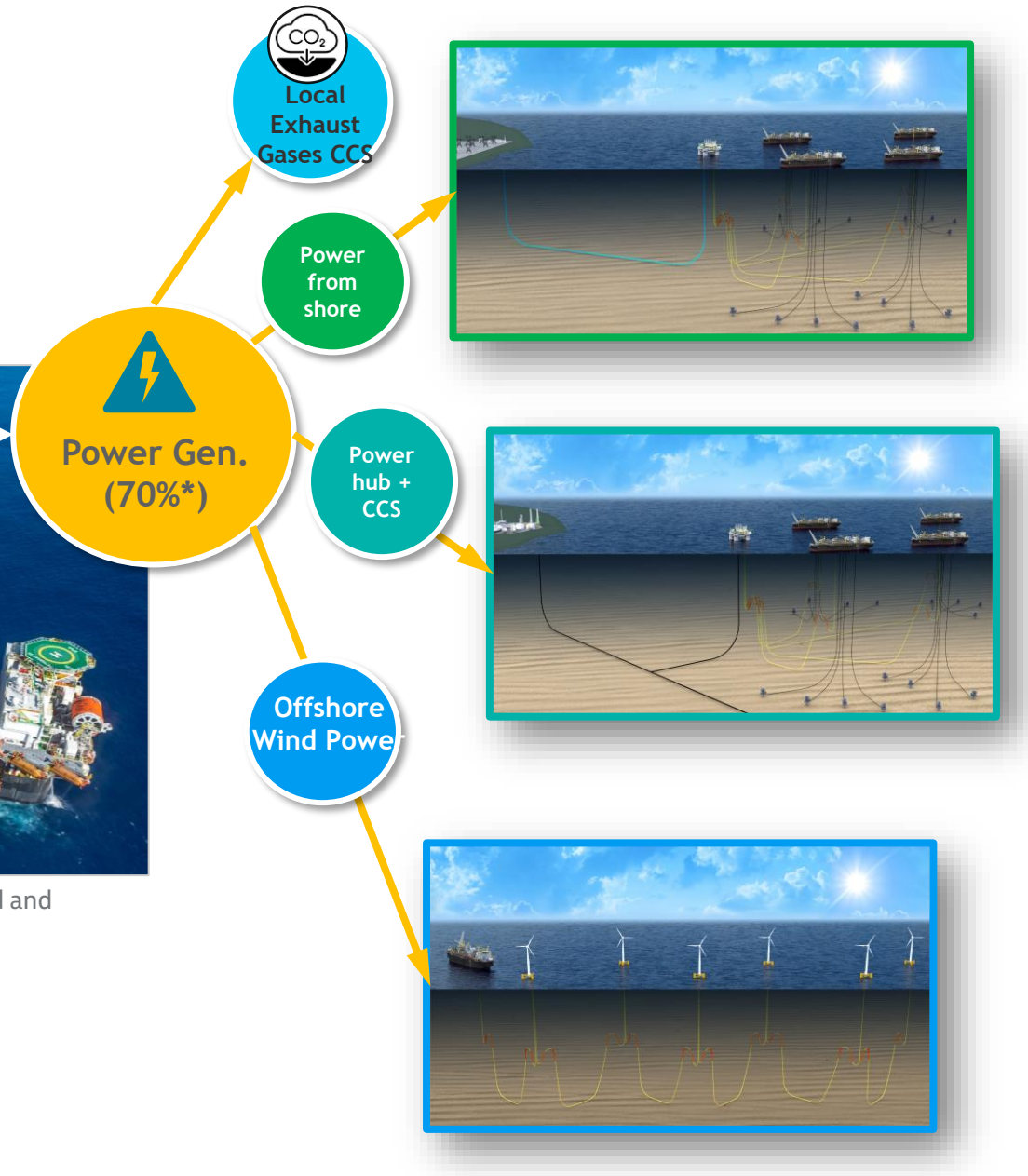
AUV

Low-Cost Pipes (PLP, TCP etc..

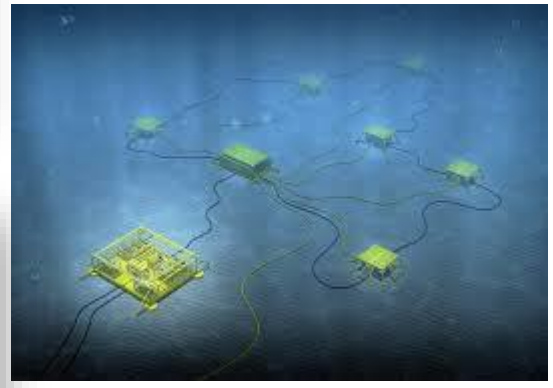
Future Trends on Offshore Power Generation

GHG Emission

* Typical order of magnitude, depending upon the oil field and FPSO design and operation

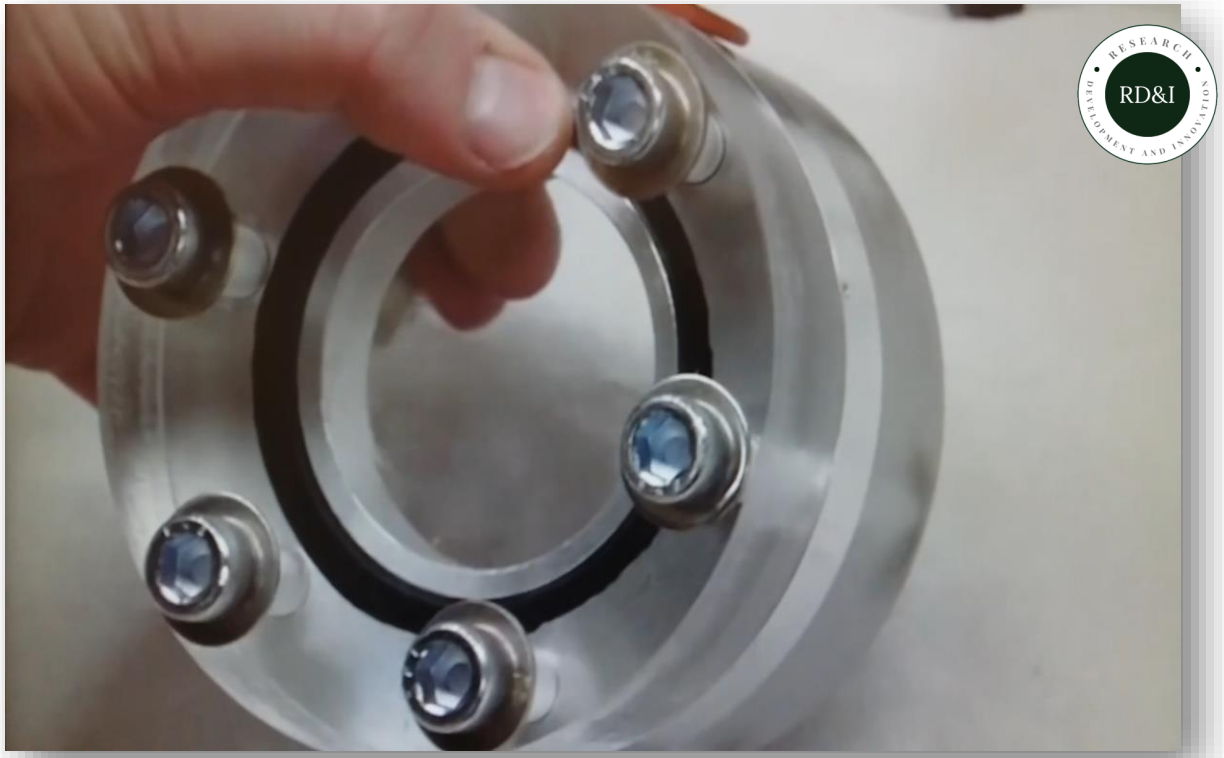


..... Next

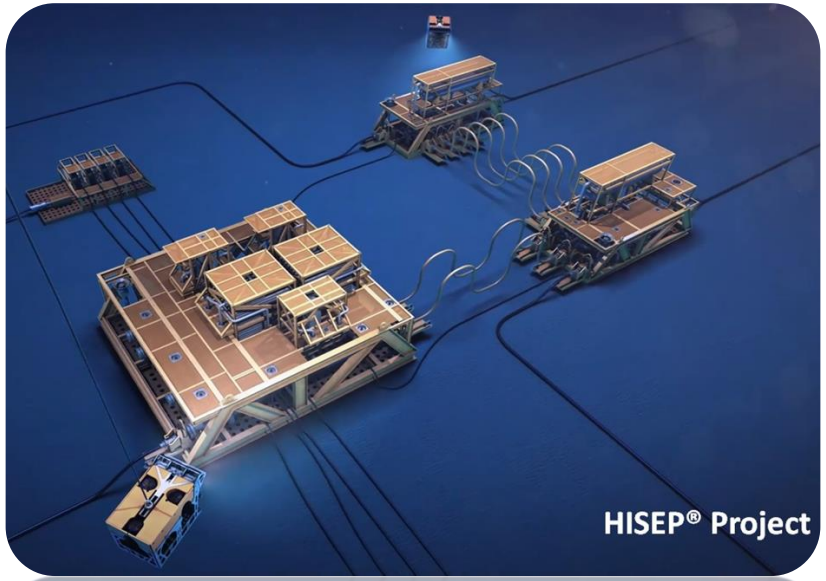


..... Subsea Low Carbon Power Generation

HISEP - Petrobras subsea technology that contributes to adding efficiency and to making projects viable



HISEP® technology was developed at Cenpes, to add value to fields with high Gas-Oil Ratio (RGO) and CO_2 content.



Allows the separation of the associated gas produced, rich in CO_2, on the seabed, transferring part of the separation process from the FPSO processing plant to the seabed.

MOTIVATION

- Accelerate production and increase the recovery factor.
- "Debottleneck" existing surface process plants.
- Reduction in footprint and weight of surface facilities
- Reduction in CAPEX, OPEX and Construction Time.
- Risk exposure reduction.
- Contribute to attenuate impacts related to carbon emissions (GHG emissions).

DEEP DIVE
PETROBRAS 2024

Engineering, Technology and Innovation Q&A session

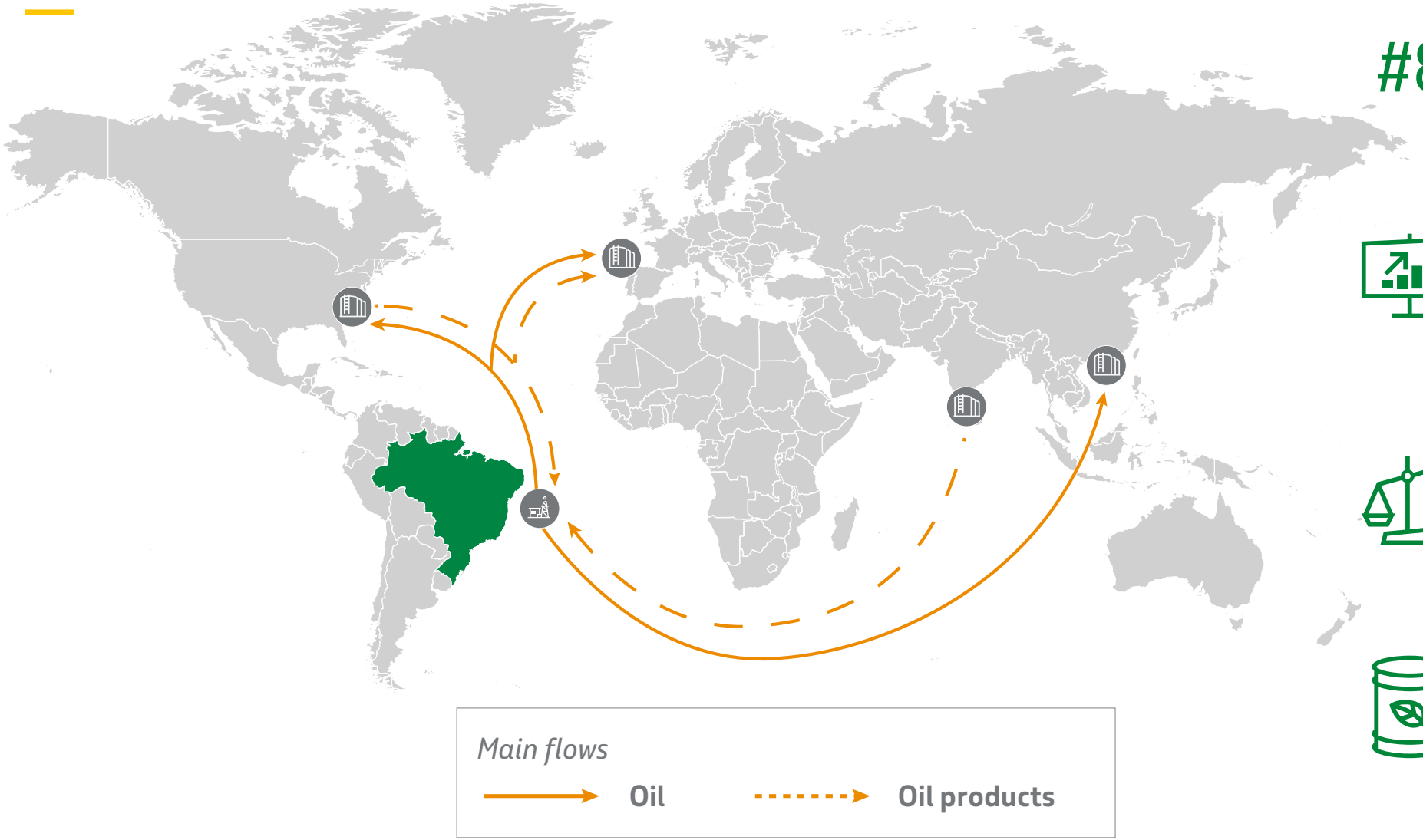
DEEP DIVE
PETROBRAS 2024

Refining, Transportation and Marketing

Claudio Schlosser
Rodrigo Abramof

PETROBRAS 70 years

Supplying the Brazilian market is the best way to monetize oil reserves and enable growth in biofuels



#8 *8th largest global consumer of oil products*

Energy mix already based on renewables with potential increase in demand

Brazil: oil surplus and oil products deficit

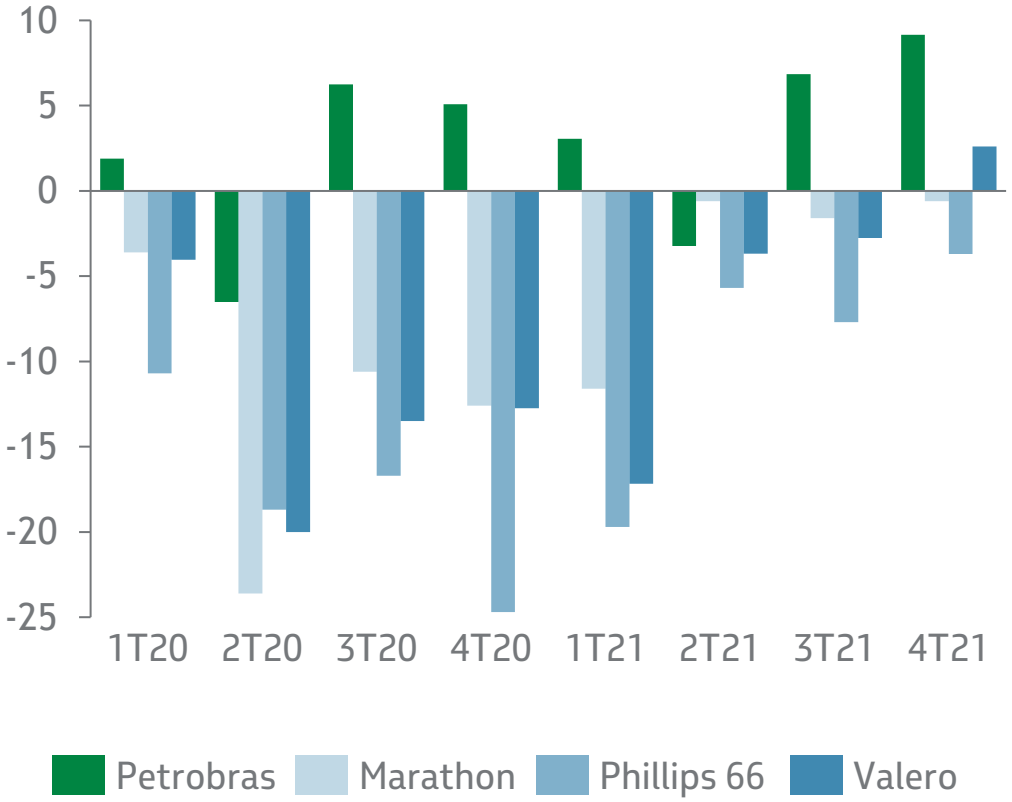
Naturally suited for biorefining due to availability of local feedstock

Integration is key for Petrobras' resilience

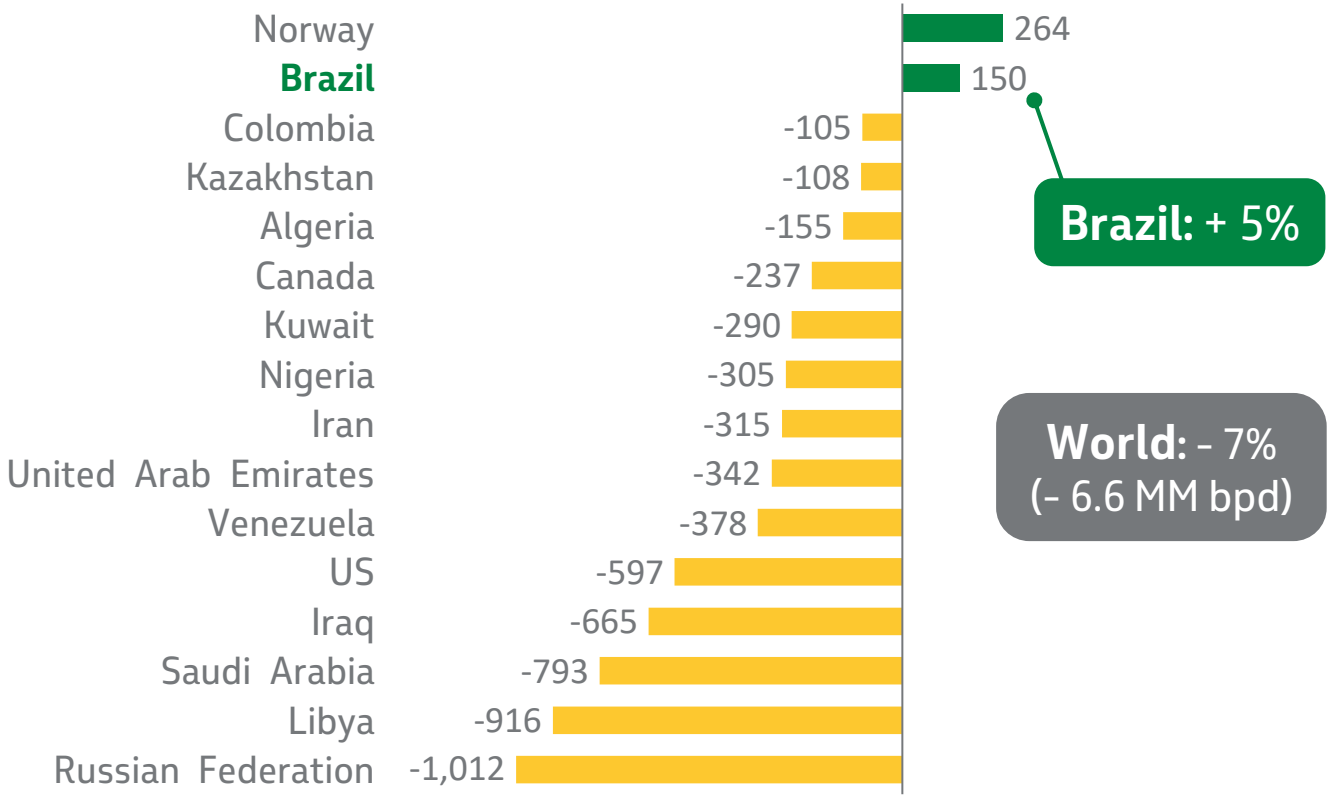
In the context of COVID, the RTC was crucial for the maintenance of our oil production

Petrobras marketing efforts captured domestic markets of oil products and enabled a record level of oil exports

Variation of Refining Utilization x 2019 Average *(pp%)*



Variation in Oil and Liquids Production *kbpd (2020 x 2019)*



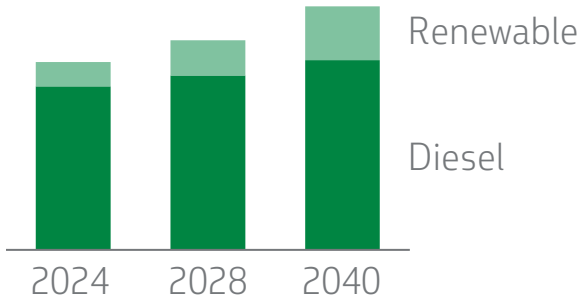
Source: BP Statistical Review of World Energy 2021
Sample includes countries with production above 500kbpd and variation above +- 100 kbpd.

In the next decade, there is space for fossil and biofuel solutions

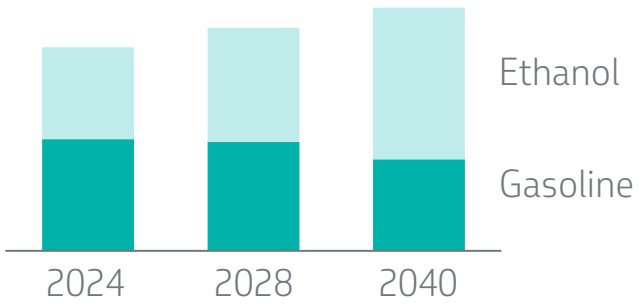
We aim to meet both the fossil energy demands and the low-carbon markets

EVOLUTION OF TRANSPORTATION SEGMENT DEMANDS IN THE BRAZILIAN MARKET

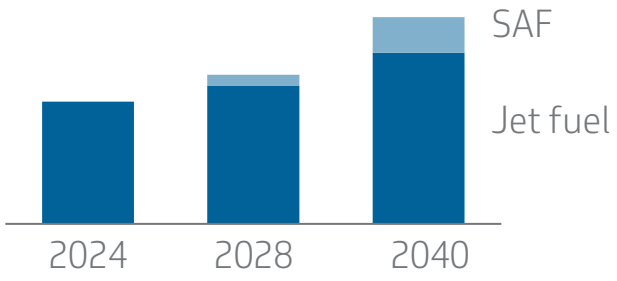
HEAVY-DUTY VEHICLES



LIGHT VEHICLES



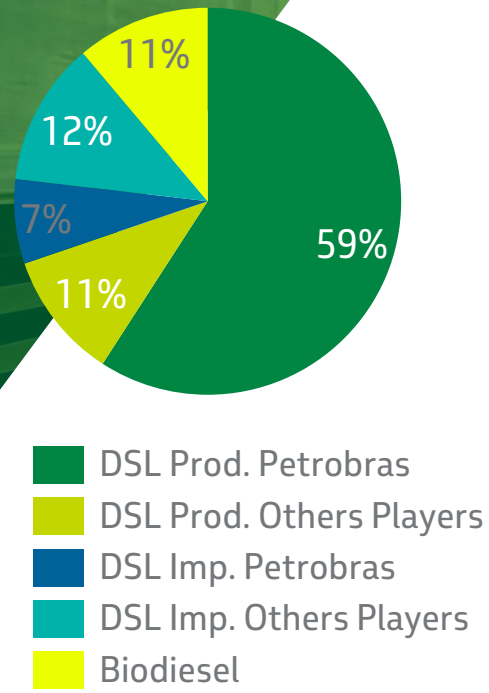
AVIATION



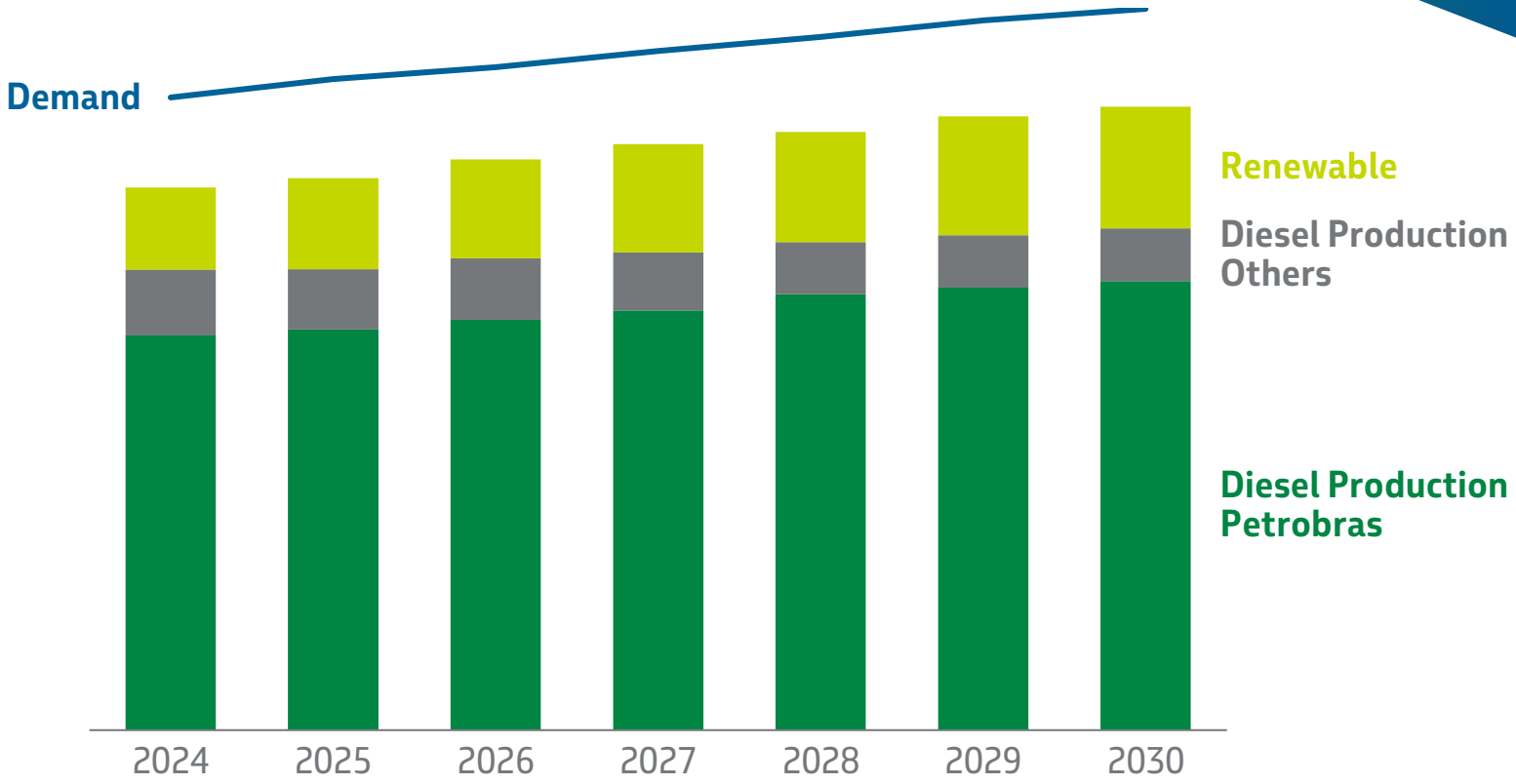
Domestic Oil Monetization

Expansion of refining capacity is geared towards meeting diesel demand

Market Share Diesel Cycle
9M23



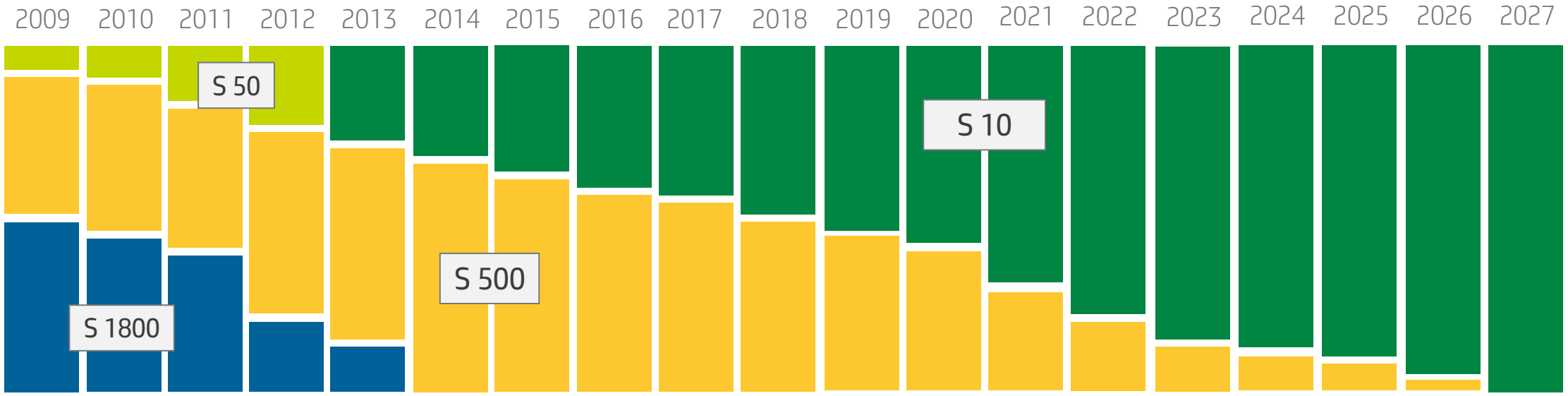
DEMAND X PRODUCTION



Source: ANP e Petrobras analysis

We are investing in hydrotreating units to support the phase out of Diesel S500

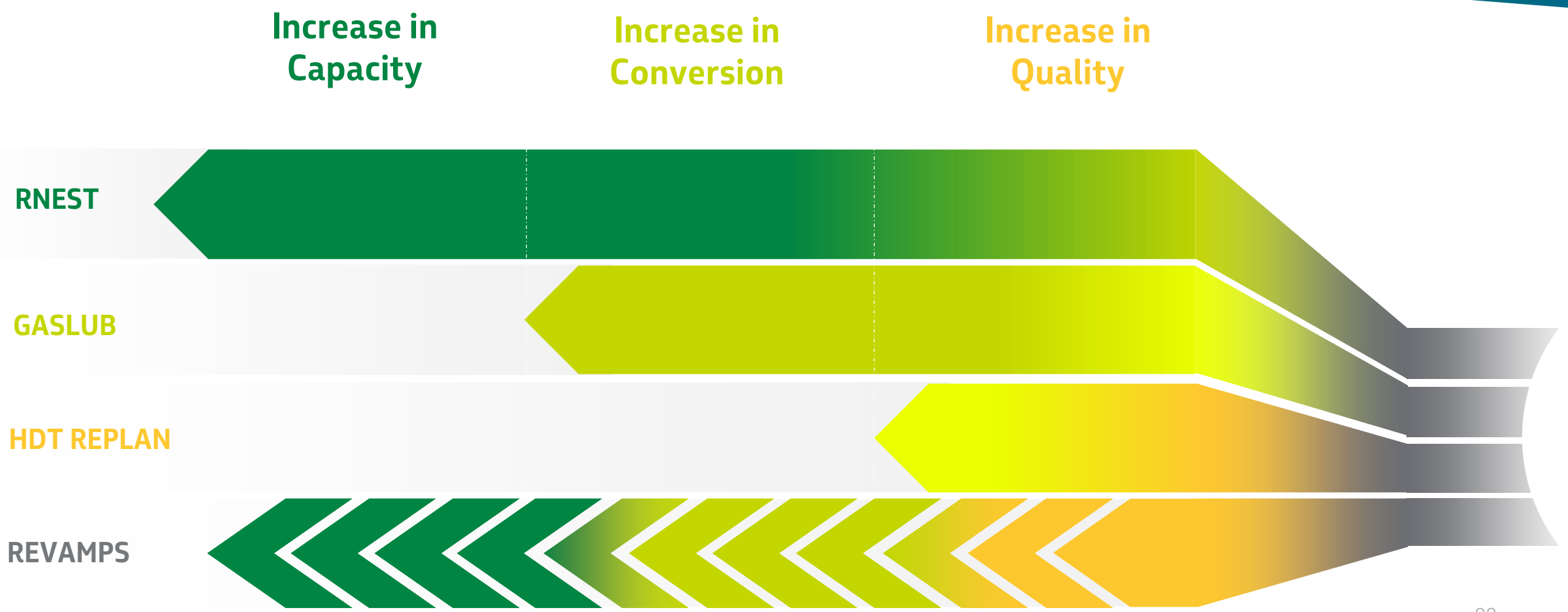
Evolution of diesel sulphur specifications in the Brazilian market



CHRONOLOGY

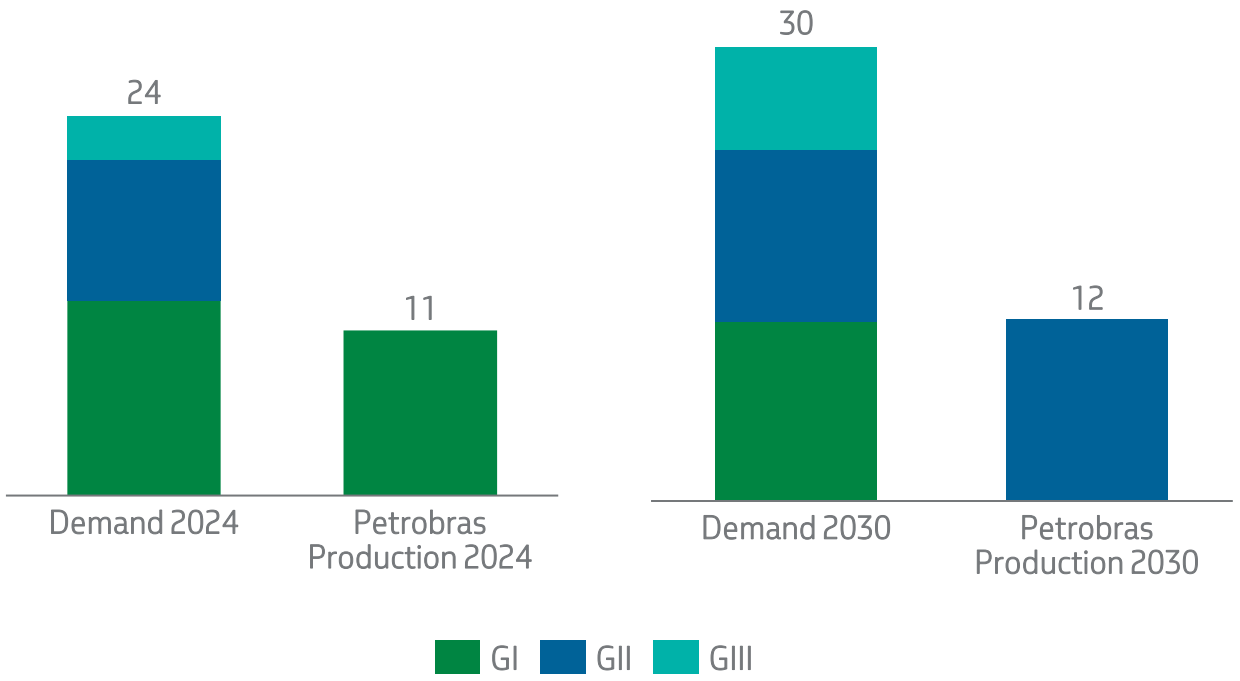
- *9 new diesel hydrotreating (HDT) units ramped up in stages between 2010 and 2020*
- *We will continue to invest in new projects (RNEST and GASLUB) and revamps in our quest for 100% S10 Diesel production capacity.*

We are investing in existing assets to increase refining capacity with higher conversion rates and product quality



We are positioning ourselves among the most advanced producers of Group II base oils

Brazil demand for base oils (GI, GII & GIII) and Petrobras production
(thousand bpd)



*Technological evolution requires the **replacement of Group I base oils by Groups II & III base oils,** considering the new technologies and quality improvement*

*Petrobras supplies **30% up to 40% of Brazilian demand** for base oil*

***GASLUB** will reduce the need for imported oil (around 100 kbpd), enabling an increase in domestic oil processing*

On the Transition Path

Several paths for the energy transition

Capital intensity

Feedstock acquisition strategies and low carbon product development

Adaptations in existing units (coprocessing)

Technological innovations (R&D)

Partnerships

Investment in biorefining dedicated plants (HVO/SAF)

We focus on sourcing sustainable raw materials for Biorefining

Diversification is the key to mitigating risks, reducing carbon intensity of raw materials and products, and generating value for Petrobras and society

Challenges

- Need for scale avaiabillity
- Carbon intensity certification
- Seasonality in supply
- Technical specifications
- Varying levels of technological and commercial maturity among suppliers
- Regional concentrations

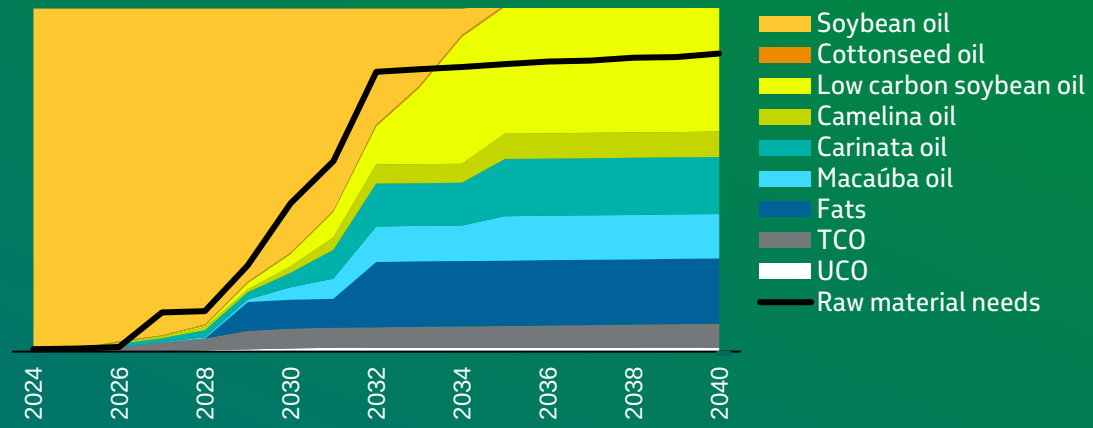
Target

Ensure the supply of raw materials for the units, including low-carbon intensity alternatives

Strategy

Diversify the portfolio through regionalized commercial strategies for acquisition and by establishing partnerships

Desirable/possible volume of Raw Material*



** For low currently available raw material, a volume achievable after development actions has been considered*

Innovations in renewable products with a market drive

PREMIUM GASOLINE (PODIUM)

Carbon-neutral Podium Gasoline:

- First gasoline in the Brazilian market to have its greenhouse gas emissions fully offset through carbon credits.

DIESEL R

Diesel R5:

- Production capacity of diesel with 5% renewable content through co-processing at REPAR, RPBC, REPLAN, and REDUC: 3.4 million m^3/year
- Certification of International Sustainability Carbon & Certification - ISCC .

Asphalt capPRO

Asphalt CAP Pro AP and CAP Pro W:

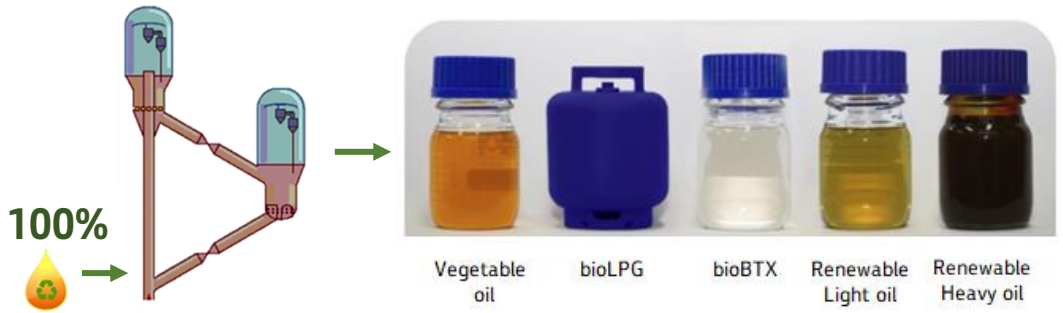
- Promotes environmental gain with the possibility of recycling aged asphalts and reducing energy consumption in application

Innovations in Biofuels production

100% RENEWABLE FEEDSTOCK PROCESSING IN FCC - A historic milestone

- *Industrial Test with 100% soybean oil. Target: Bioaromatics maximization*
- *Partnership with Riograndense Refinery (Petrobras-Braskem-Ultra JV)*
- *Dedicated Catalyst produced at FCC SA (Petrobras-Ketjen JV)*

Opportunity of retrofitting the Riograndense Refinery as the *First Latin American Biorefinery*



BUNKER WITH RENEWABLE CONTENT

- *Tests were carried out in 2023 with bunker containing 10 and 24 % of biodiesel (FAME)*
- *New test is underway with fuel containing 24% FAME (tallow, Certification ISCC EU RED)*
- *Partnership with Transpetro and Maersk Tankers*
- *Alternative fuels/feedstocks as enablers for introducing renewable content in bunker fuel*

Technological and operational partnerships will drive Petrobras to global leadership in the Energy Transition

Benefits of partnerships

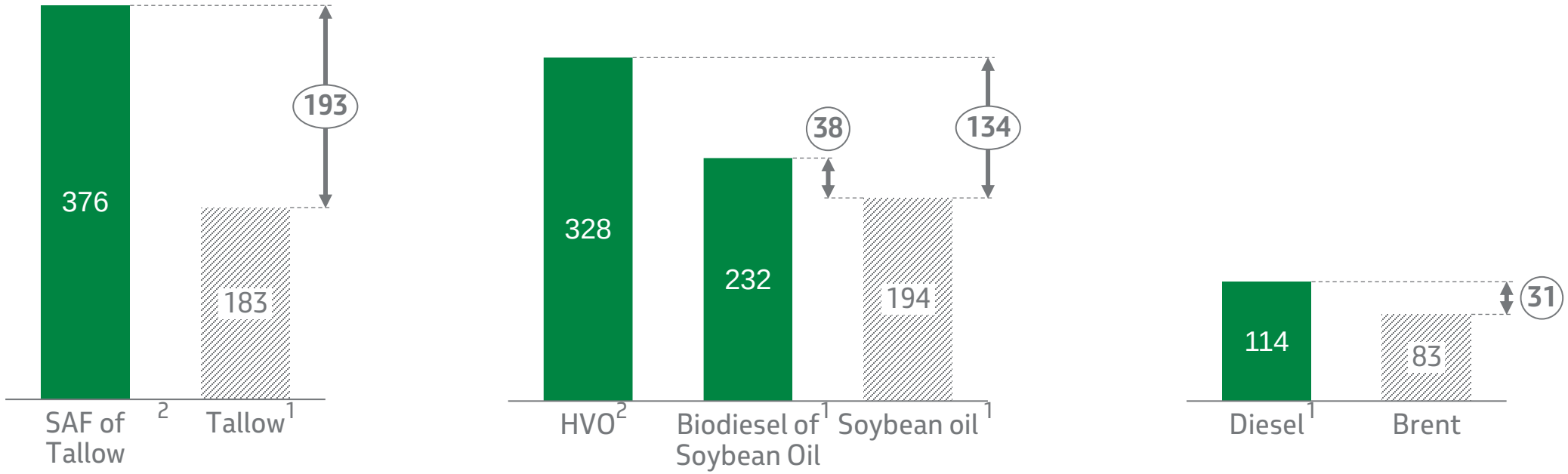
Risk sharing
Exchange of knowledge and experiences
Access to technological resources
Synergy utilization
Access to markets or raw materials

We have more than 30 MoUs, NDAs, and TEAs signed with partners *for the development of more sustainable products and raw materials.*

Biorefining dedicated plants add value to the refining park with more efficient processes and new products, towards a low-carbon market

- *Growing demand for renewable fuels due to international and Brazilian goals*
- *Public policies in the USA and Europe have favored 100% drop-in products (SAF and HVO) over biodiesel, resulting in higher unit margins*

2023 average price in US$/bbl



[1] USG [2] California

Low Carbon Products

LONG TERM 2040

TECHNOLOGICAL INITIATIVE

Insertion of **low-carbon products in the fuels and chemicals chains**, aiming at maintaining the market in segments of difficult electrification and leveraging **new business opportunities** for PETROBRAS.

Roadmap

SHORT TERM

Retrofit of refining units for coprocessing renewables feedstocks

2025

Deployment of mature technologies and elimination of technology gaps

MEDIUM TERM

Technologies for biofuels dedicated units and high coprocessing content

2030

Deployment of emerging technologies and new raw material supply chains

LONG TERM

To be a relevant player in biofuels worldwide market

2040

Leadership in the value chain of low-carbon fuels and products

RESEARCH DEVELOPMENT AND INNOVATION RD&I

Operational Excellence and Expansion

Our integrated refining facilities enable us to supply most of the domestic market

Refining in numbers:

INSTALLED CAPACITY

~1,800 kbpd

10 Petrobras operated Refineries

17 Atmospheric Crude Units

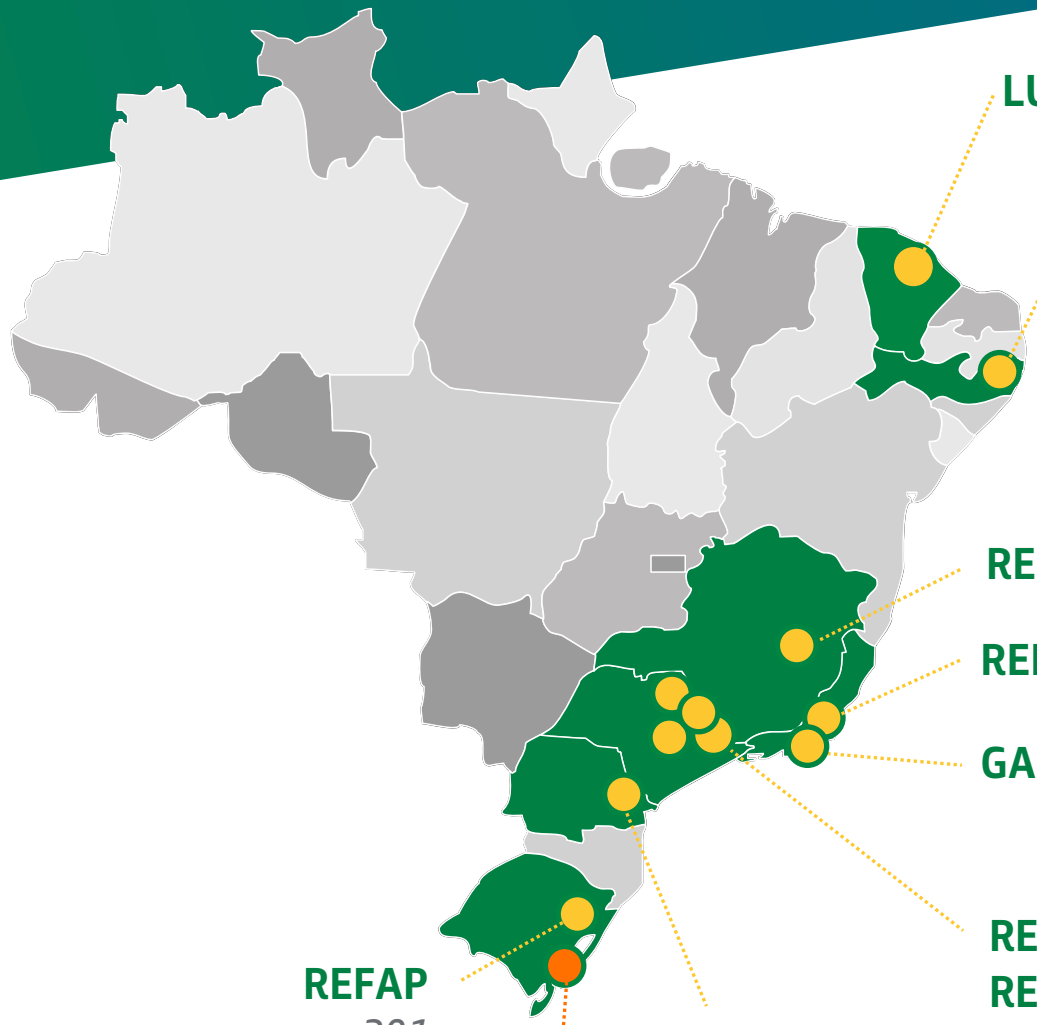
11 FCCs

10 Cokers

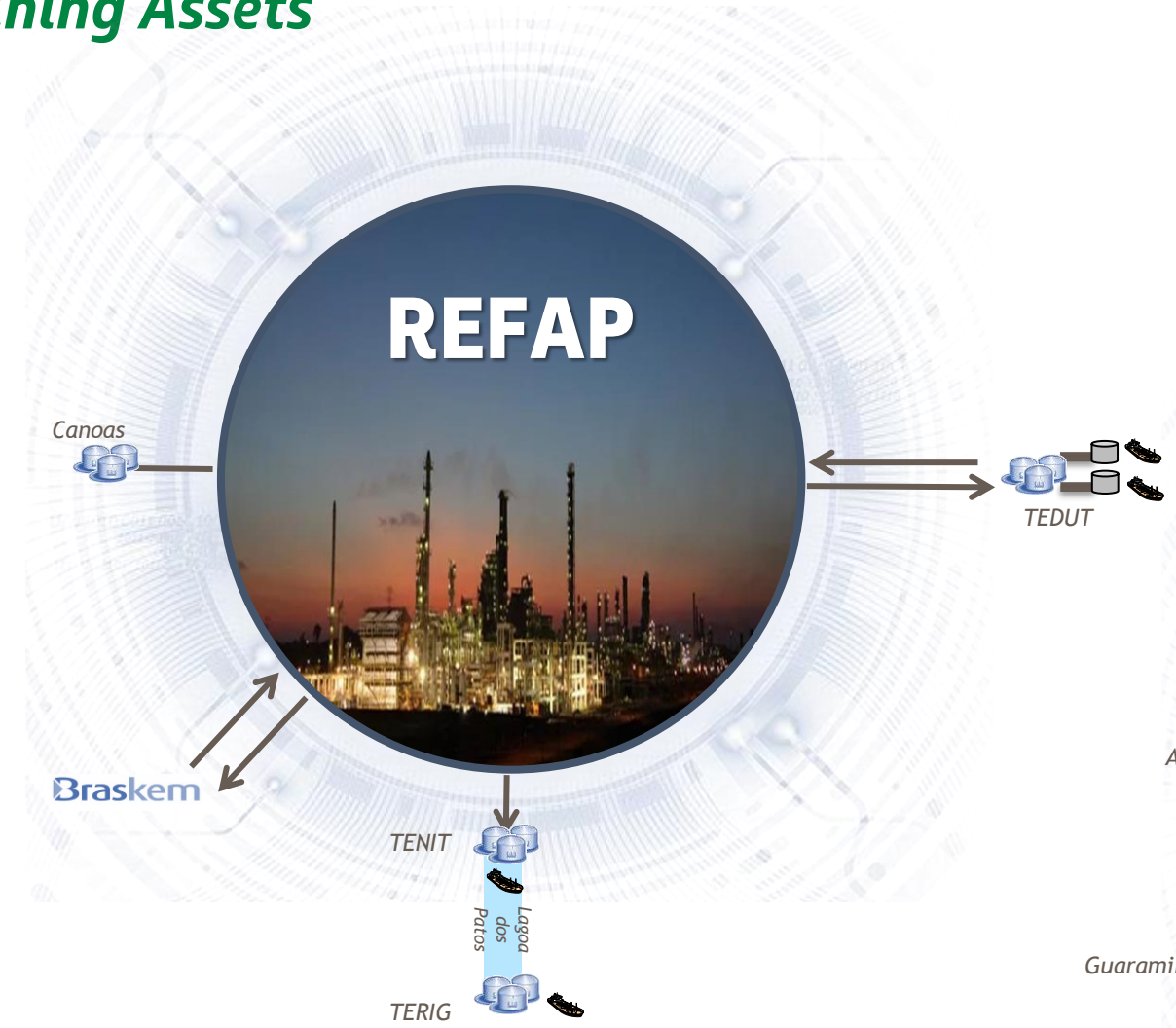
42 HDTs

05 Catalytic Reformings

Capacities in kbpd

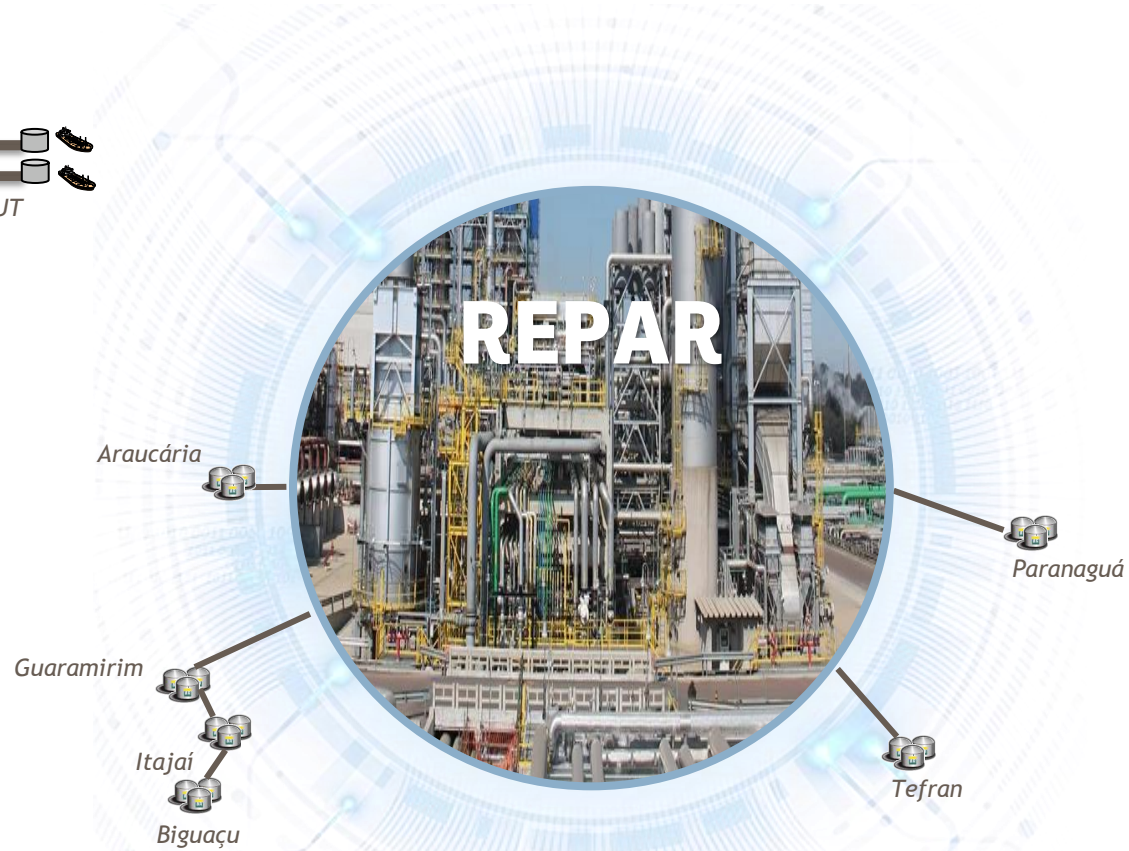


Refining Assets

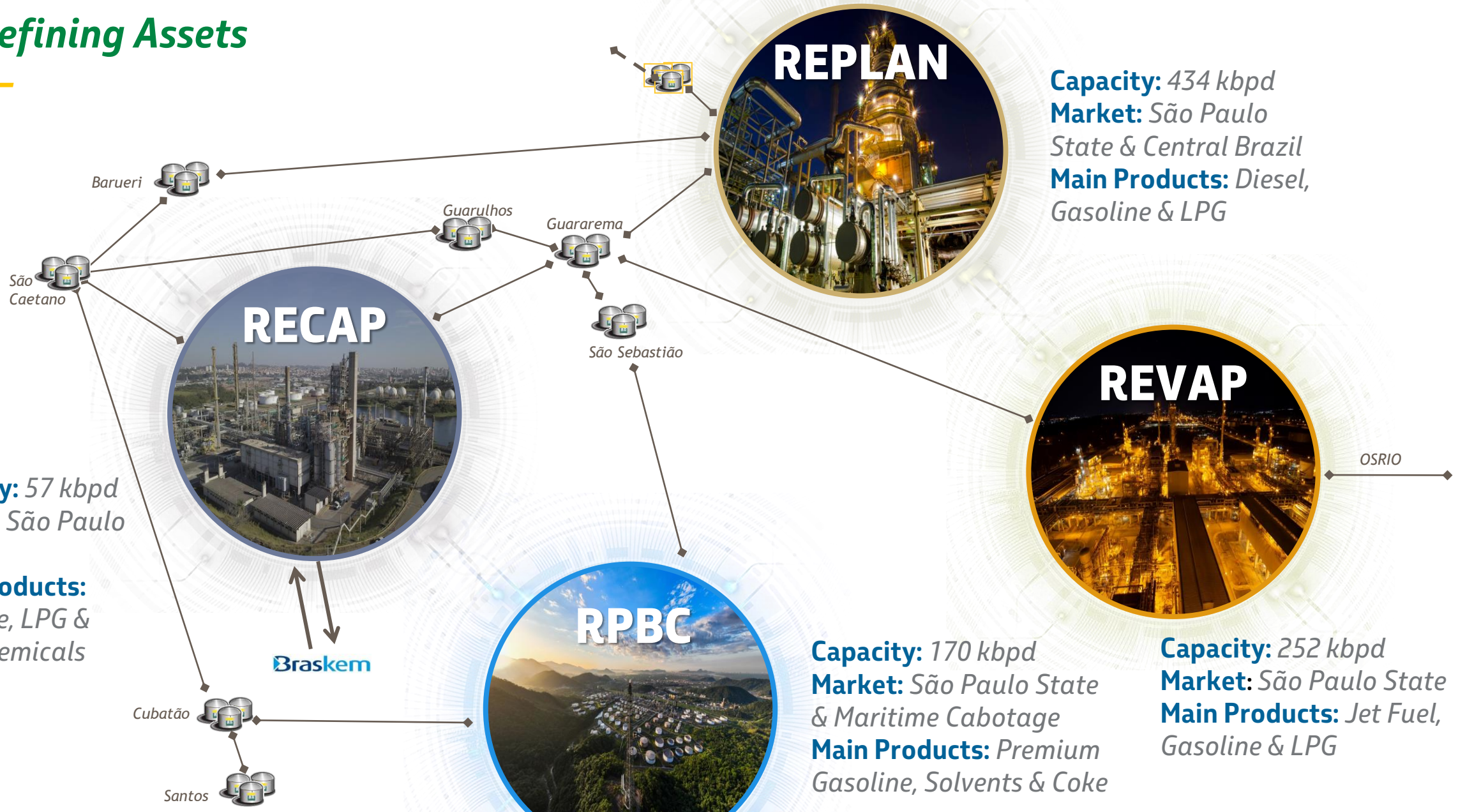


Capacity: *201 kbpd*
Market: *South & Maritime Cabotage*
Main Products: *Diesel, Gasoline & Petrochemicals*

Capacity: *208 kbpd*
Market: *South & Southeast*
Main Products: *Diesel & Gasoline*



Refining Assets



Capacity: *434 kbpd*
Market: *São Paulo State & Central Brazil*
Main Products: *Diesel, Gasoline & LPG*

Capacity: *57 kbpd*
Market: *São Paulo City*
Main Products: *Gasoline, LPG & Petrochemicals*

Capacity: *170 kbpd*
Market: *São Paulo State & Maritime Cabotage*
Main Products: *Premium Gasoline, Solvents & Coke*

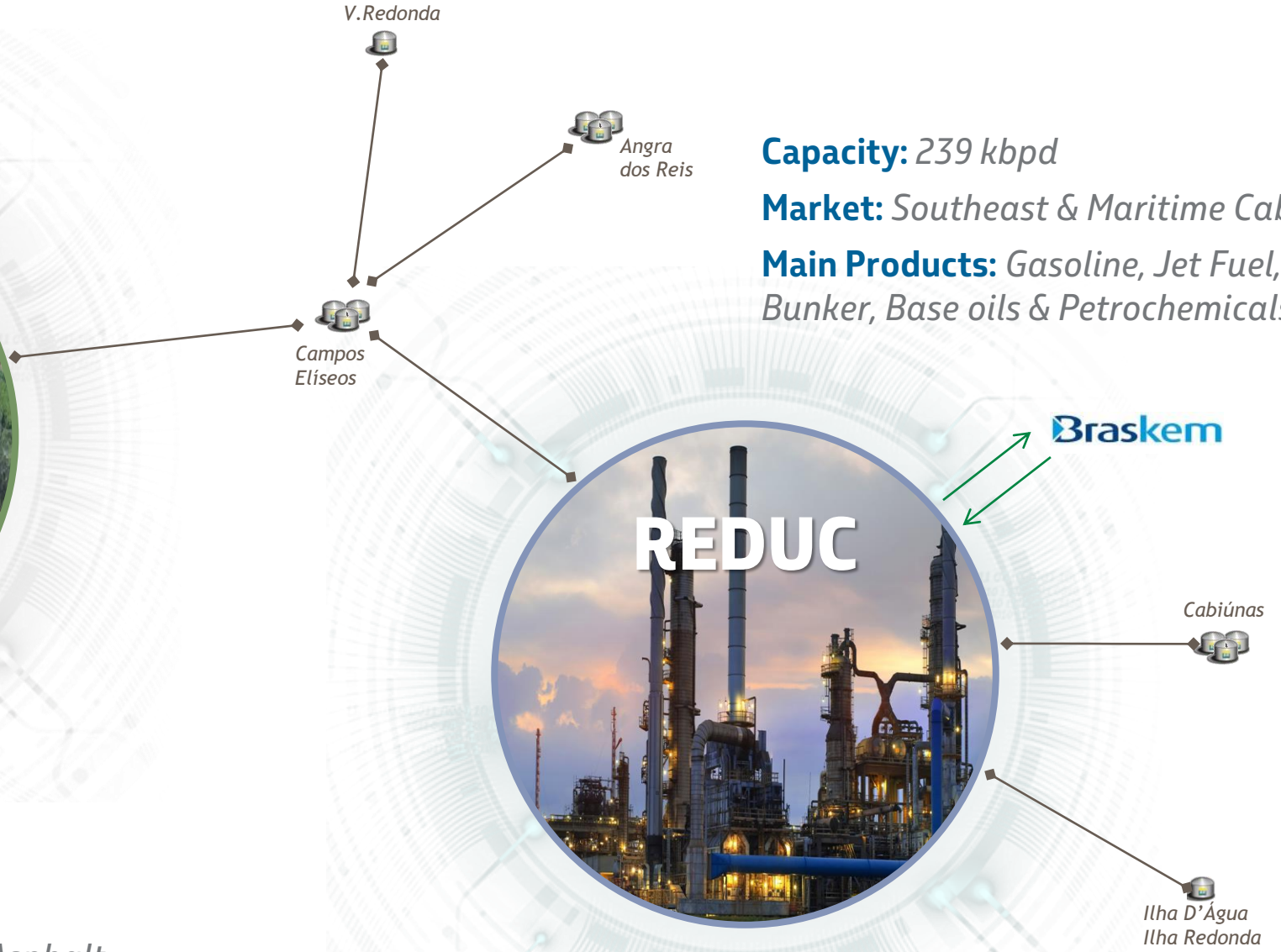
Capacity: *252 kbpd*
Market: *São Paulo State*
Main Products: *Jet Fuel, Gasoline & LPG*

Refining Assets

Capacity: *157 kbpd*

Market: *Southeast*

Main Products: *Gasoline, Bunker & Asphalt*



Capacity: *239 kbpd*

Market: *Southeast & Maritime Cabotage*

Main Products: *Gasoline, Jet Fuel, LPG, Bunker, Base oils & Petrochemicals*

Refining Assets

Capacity: *88 kbpd*

Market: *Northeast & Maritime Cabotage*

Main Products: *Diesel*

Capacity: *8 kbpd*

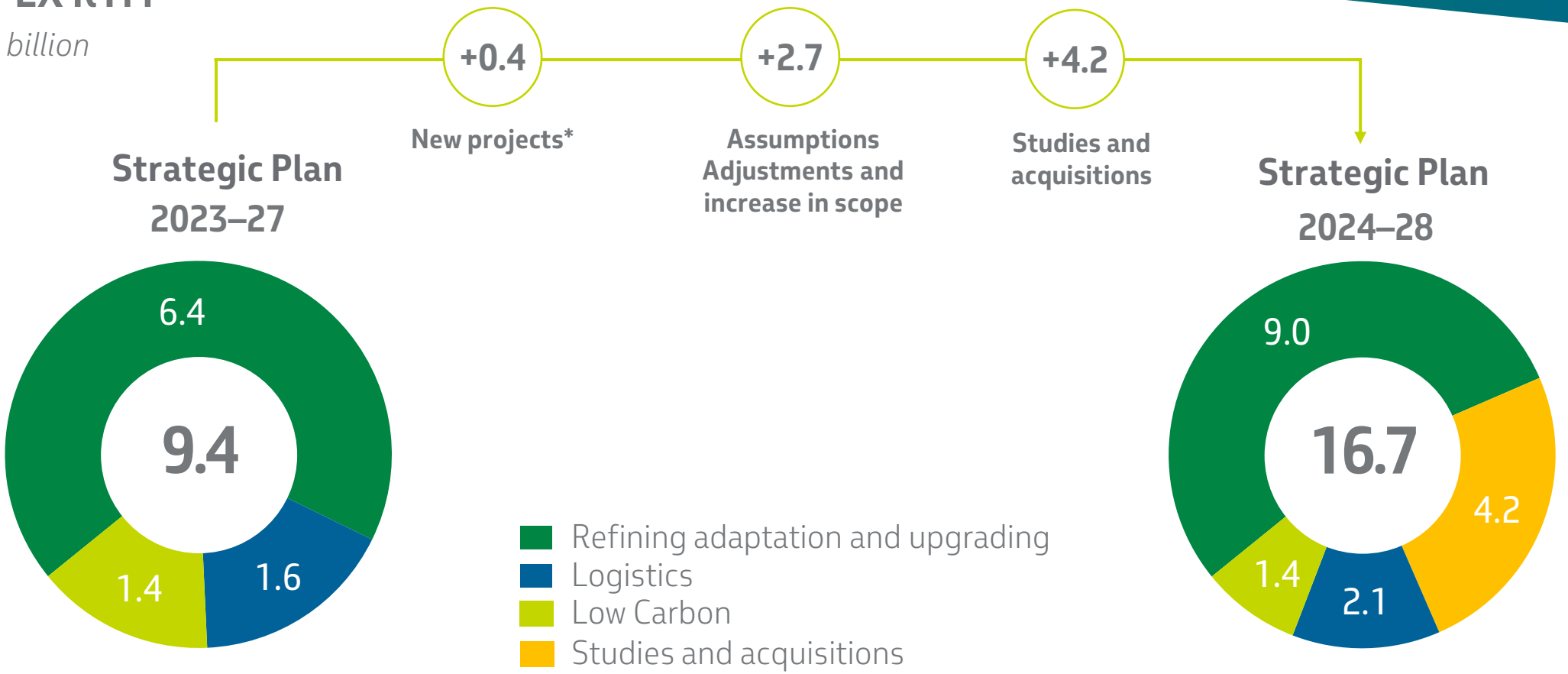
Market: *Northeast*

Main Products: *Naphthenic Base Oils & Asphalt*

More investments to adapt and improve the Refining and Logistics complex

CAPEX RTM

US$ billion



** Second biorefining plant, HDT Repar and ships*

With a focus on high-value, low carbon products

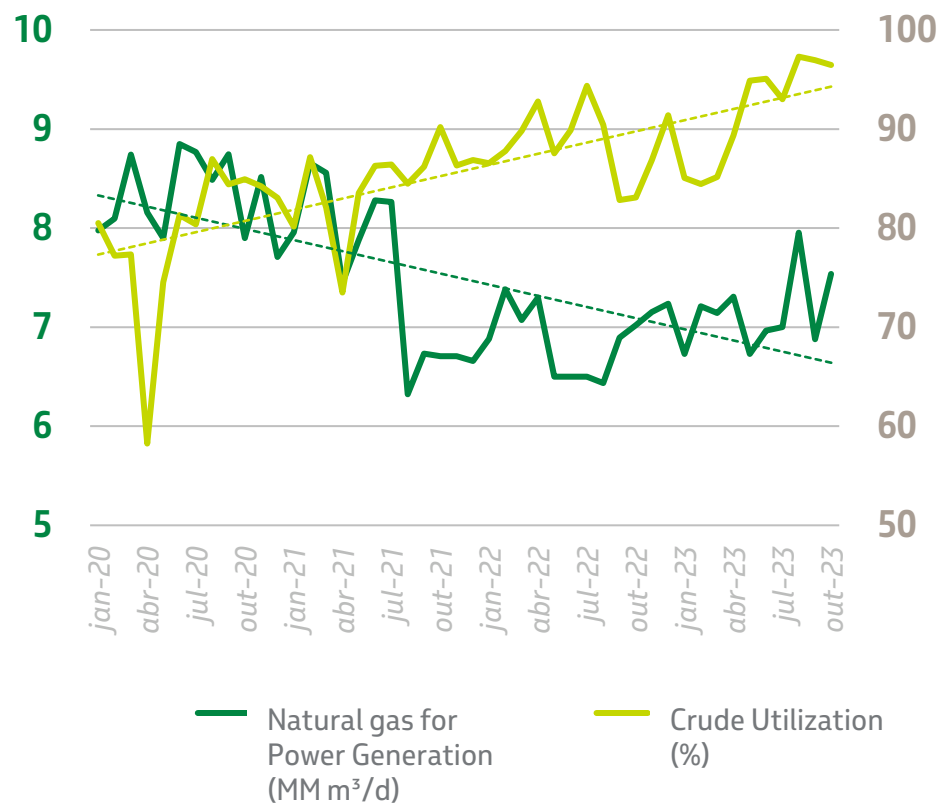
***RefTOP* Program and Operational Reliability**		• *CO Boiler (RECAP), Thermopower Plant (REDUC), FCC Blowers and Wet Gas Compressors* • *Turnarounds*
Crude Capacity Expansion	**225 kbpd**	• *RNEST: Revamp Train 1 and implementation of Train 2* • *Revamps of current facilities*
ULSD Production Capacity Expansion	**> 290 kbpd*** **	• *New units HDT/HCC GASLUB*** • *REPLAN new HDT* • *Implementation of RNEST Train 2* • *Revamps of current facilities*
Non-fuel products	**12 kbpd**	• *New unit HIDW GASLUB***
BioRefining*	**34 kbpd**	• *Dedicated plant in RPBC (SAF / 100% renewable Diesel)*** • *Dedicated plant GASLUB***
Petrochemicals and Fertilizers		• *Projects under study*

** 100% Renewable (Diesel R100) | ** Projects 2028+ | *** 80% new capacity / 20% revamps*

RefTOP and Operational Reliability

The RefTOP program has achieved significant results since start-up

Reduced natural gas for energy consumption from 2020 through 2023, while improving crude capacity utilization.

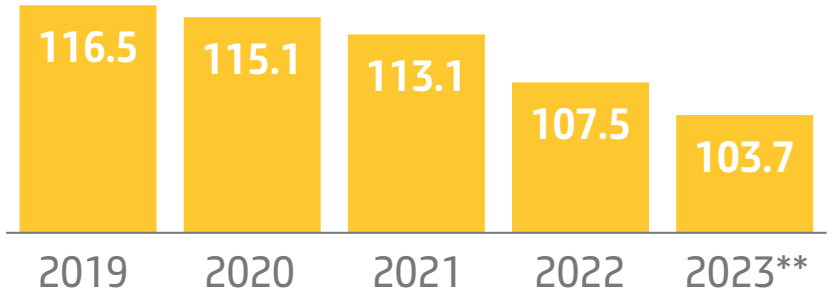


PROGRAM GAINS
2021-2023
US$ 589 million

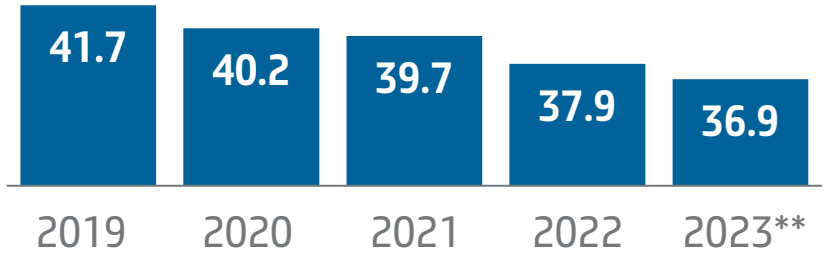
RefTOP Goals – Our Refining Facilities among the best in the world in operational and energy efficiency by 2030*

New investments to achieve Energy Intensity ≤ 89 and GHG Intensity ≤ 30kg CO_{2eq}/CWT

ENERGY INTENSITY INDEX



GHG INTENSITY IN REFINING



- *New CO Boiler at RECAP*
- *New Thermopower Plant at REDUC*
- *New FCC Blowers and Wet Gas Compressors at RPBC, REPLAN, REDUC, REPAR and REFAP*

NEW INVESTMENTS
2024-2028***
US$ 776 million

** 1st quartile - benchmark USA refiners | ** Estimated | *** Investments of US$ 1.1 billion until 2030*

Operational Reliability: Refineries Turnarounds, Revamps, and plants renewal

Assuring Operational Availability in the long term

REPLAN FCC/HDS 2024

173 heat exchangers, 68 vessels,
18 towers, 5 reactors, 3 furnaces
Total Personnel: 3,300

REPAR COK/HDT 2024

336 heat exchangers, 451
vessels, 29 towers, 17 reactors,
13 furnaces
Total Personnel: 3,500

REFAP DST/FCC/COK 2024

153 heat exchangers, 78 vessels,
23 towers, 5 reactors, 7 furnaces
Total Personnel: 4,500

REDUC DST 2024

68 heat exchangers,
26 vessels, 13 towers,
4 furnaces
Total Personnel: 1,200

RECAP INT 2024

31 heat exchangers,
3 vessels, 7 reactors,
2 furnaces
Total Personnel: 1,500

RPBC DST/FCC/COK 2024

112 heat exchangers, 94 vessels,
14 towers, 6 furnaces, 1 reactor
Total Personnel: 2,000

Investments

US$ 0.7 billion *in 2024*

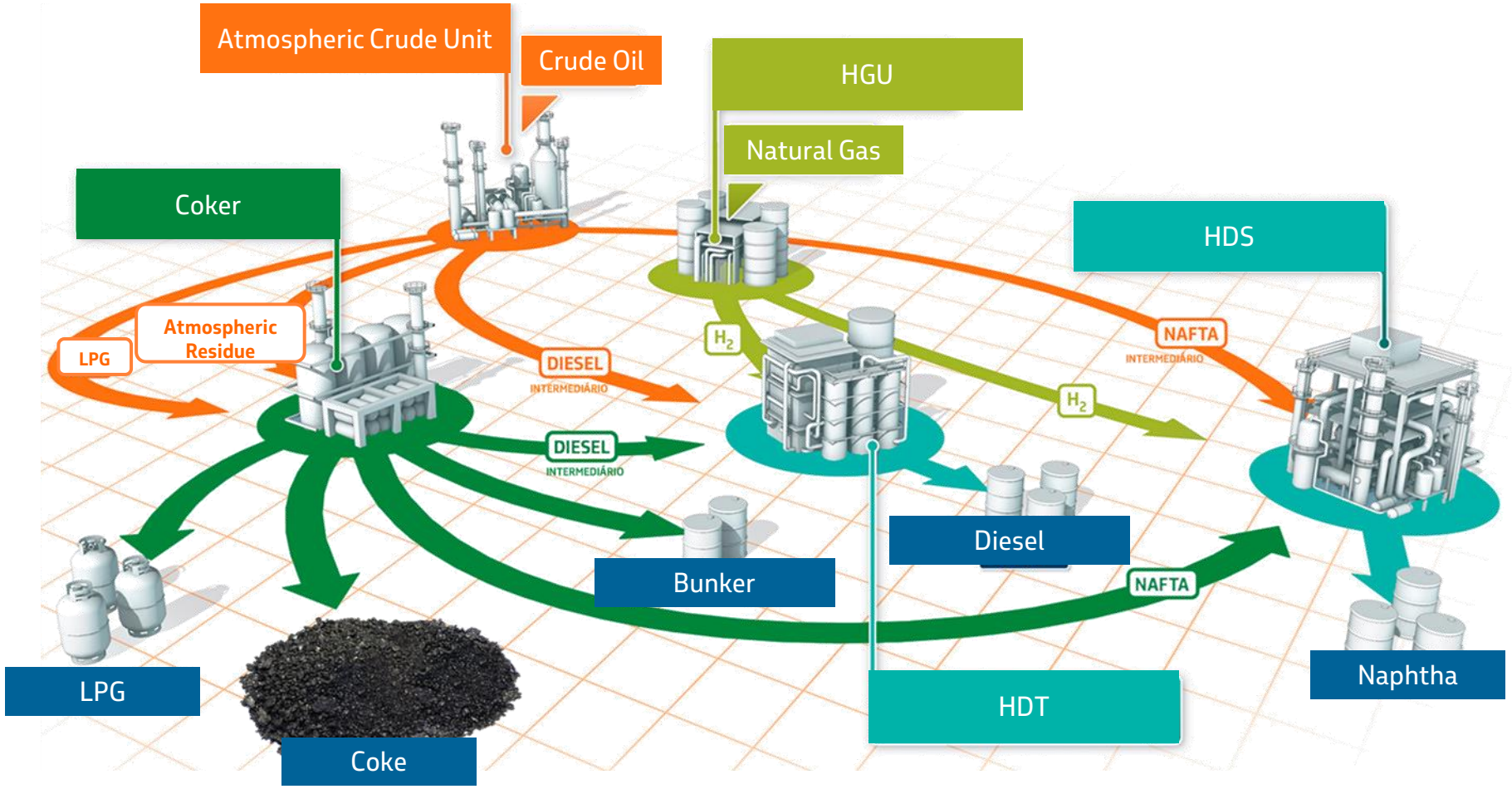
US$ 3.3 billion *during the 2024-2028 period*

Crude Capacity Expansion, Diesel and Lubricants Production

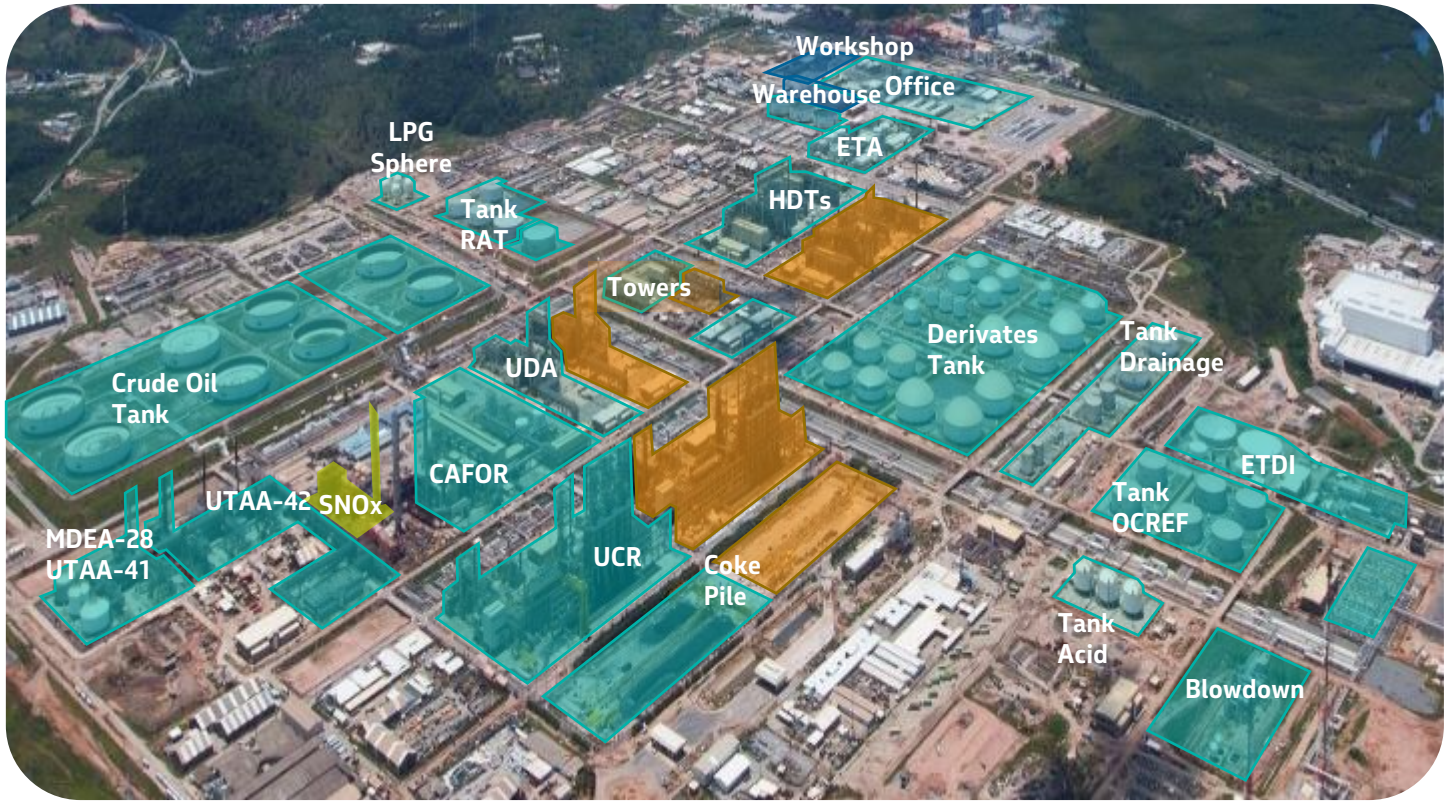
RNEST is the main project for capacity expansion

- *Petrobras' main hub in the North-Northeast region*
- *Beginning of operations with Train 1 in 2014*
- *Diesel maximization*

RNEST – Simplified Process Scheme



Expanding capacity and improving quality of RNEST products



Train 1 Revamp: Interventions in the Distillation Unit (UDA), Delayed Coking Unit (UCR) and Pipes

OPERATING SINCE 2014

Train 1 — Capacity 88 kbpd

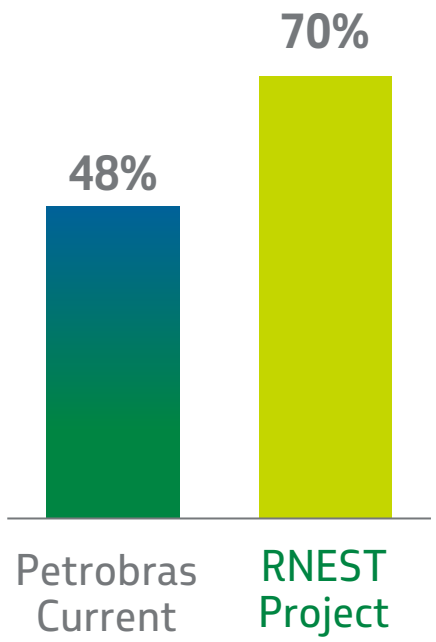
EXPANSION IN PROGRESS

	2024	2025	2028
Start of Operations			
Status	Construction in progress	Construction in progress	Under procurement
	Gas Treatment	**REVAMP Train 1**	**Train 2**
	+27 kbpd	+15 kbpd	+ 130 kbpd

Completion of RNEST project is highly value-accretive

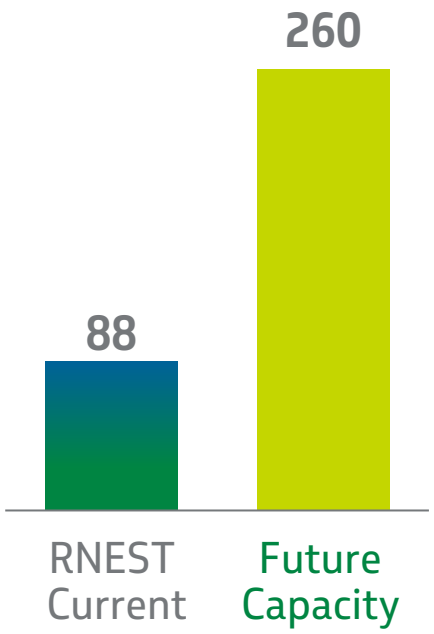
MIDDLE DISTILLATES HIGH YIELD

Diesel + Jet fuel yield (%)



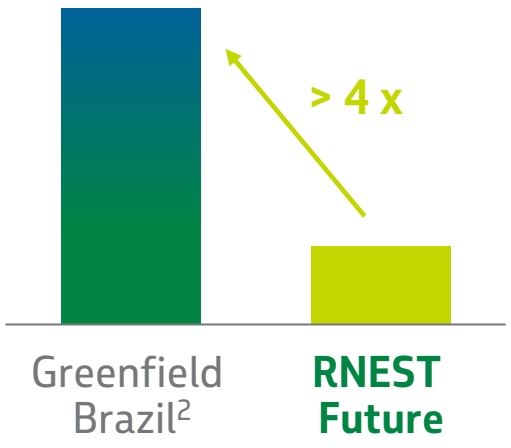
SIGNIFICANT CAPACITY INCREASE

Distillation Capacity[1] (kbpd)

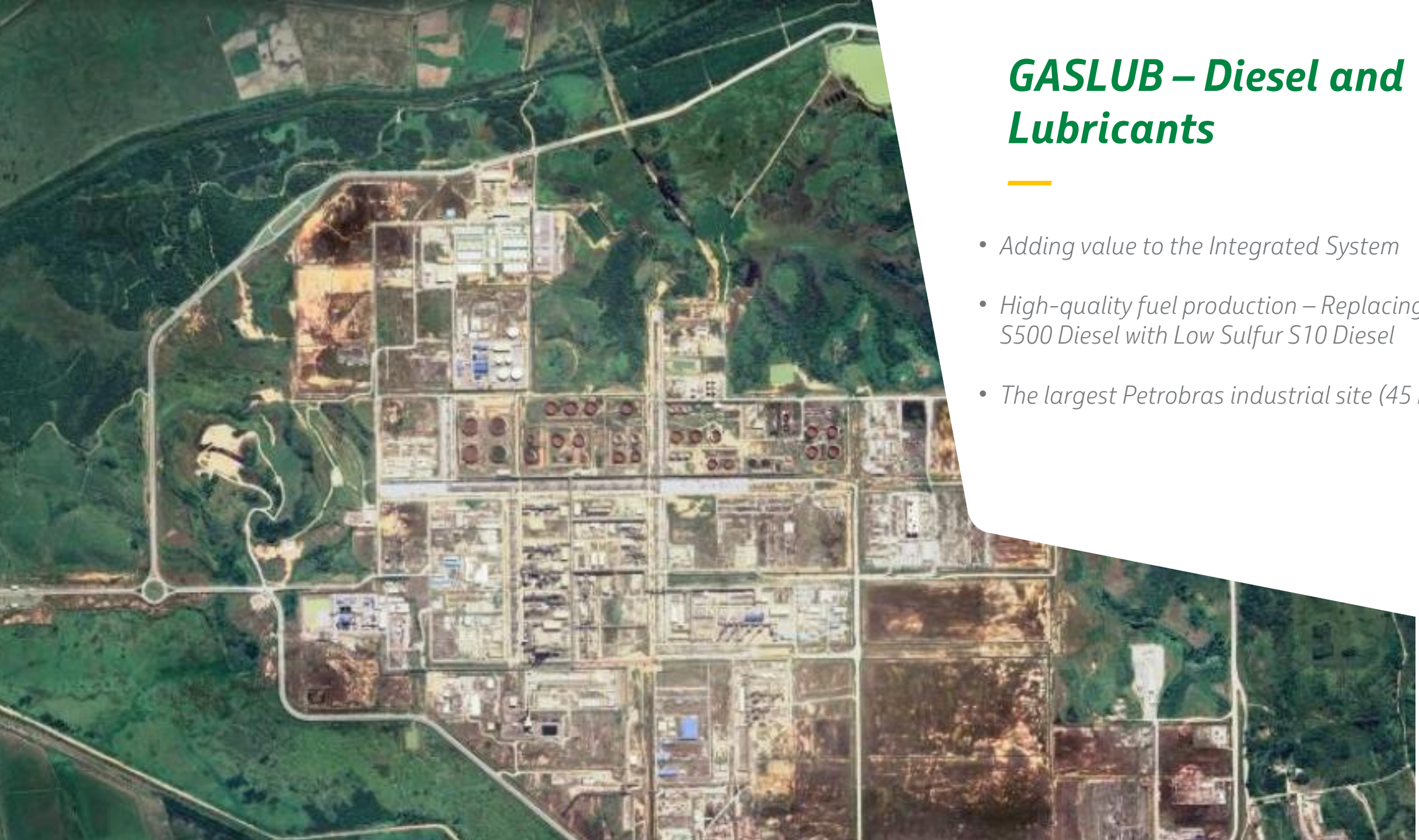


COMPETITIVE CAPEX

Capex per barrel



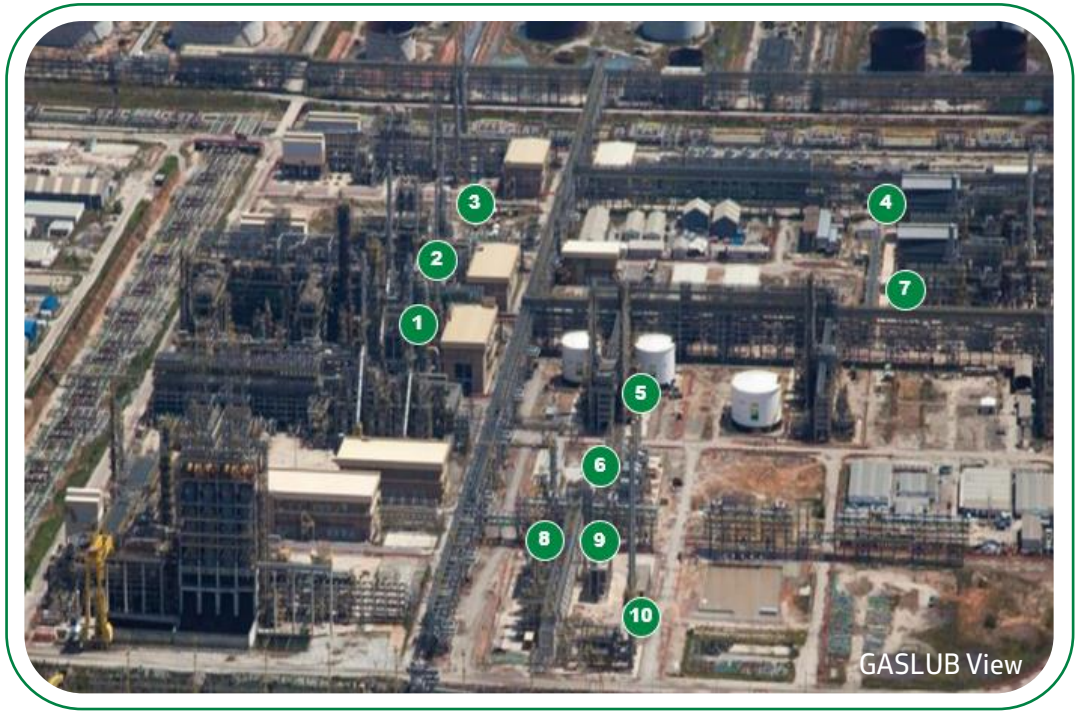
[1] *Considering reference feedstock*
[2] *Petrobras estimates based on outside Consulting data*



GASLUB – Diesel and Lubricants

- *Adding value to the Integrated System*
- *High-quality fuel production – Replacing S500 Diesel with Low Sulfur S10 Diesel*
- *The largest Petrobras industrial site (45 km²)*

GASLUB - Procurement expected for the 1st half of 2024



GASLUB View

1. Catalytic Hydrocracking
2. Diesel Hydrotreating
3. HIDW – Hydroisodewaxing
4. Steam Reforming (Hydrogen)
5. Sour Water Treatment
6. Amine Treatment
7. Regenerative caustic treatment
8. Tail Gas Treatment
9. Sulphur Recovery
10. Ammonia Oxidation

Additional S10 diesel capacity

+76 kbpd

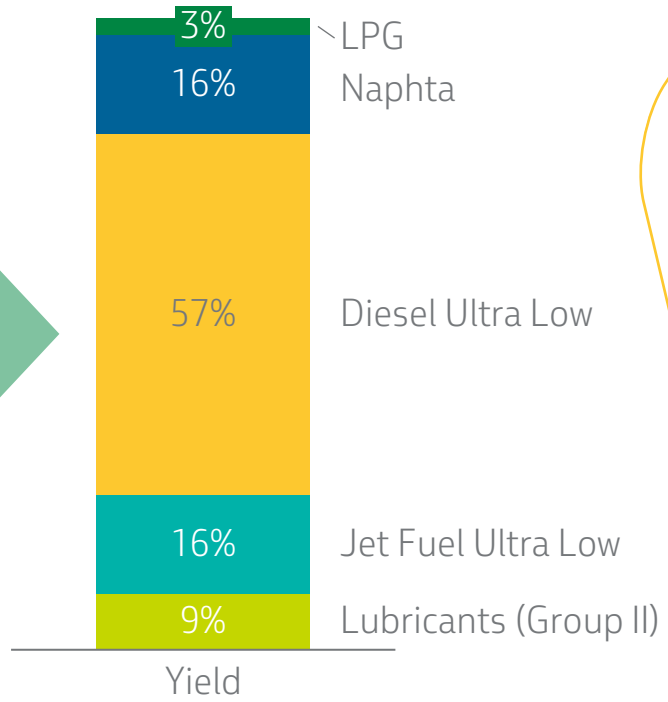
Production of base oil for Group II lubricants

+12 kbpd

GASLUB Project focuses on adding conversion capacity for Low Sulphur Diesel and Group II Lubricants

PRODUCTION PROFILE

Main feedstock: heavy gasoil produced at REDUC



ULSD production expansion

Investments in upgrades account for more than US$ 600 MM

HDTs for ULSD

Installation of the vacuum drying tower at REPLAN's new HDT

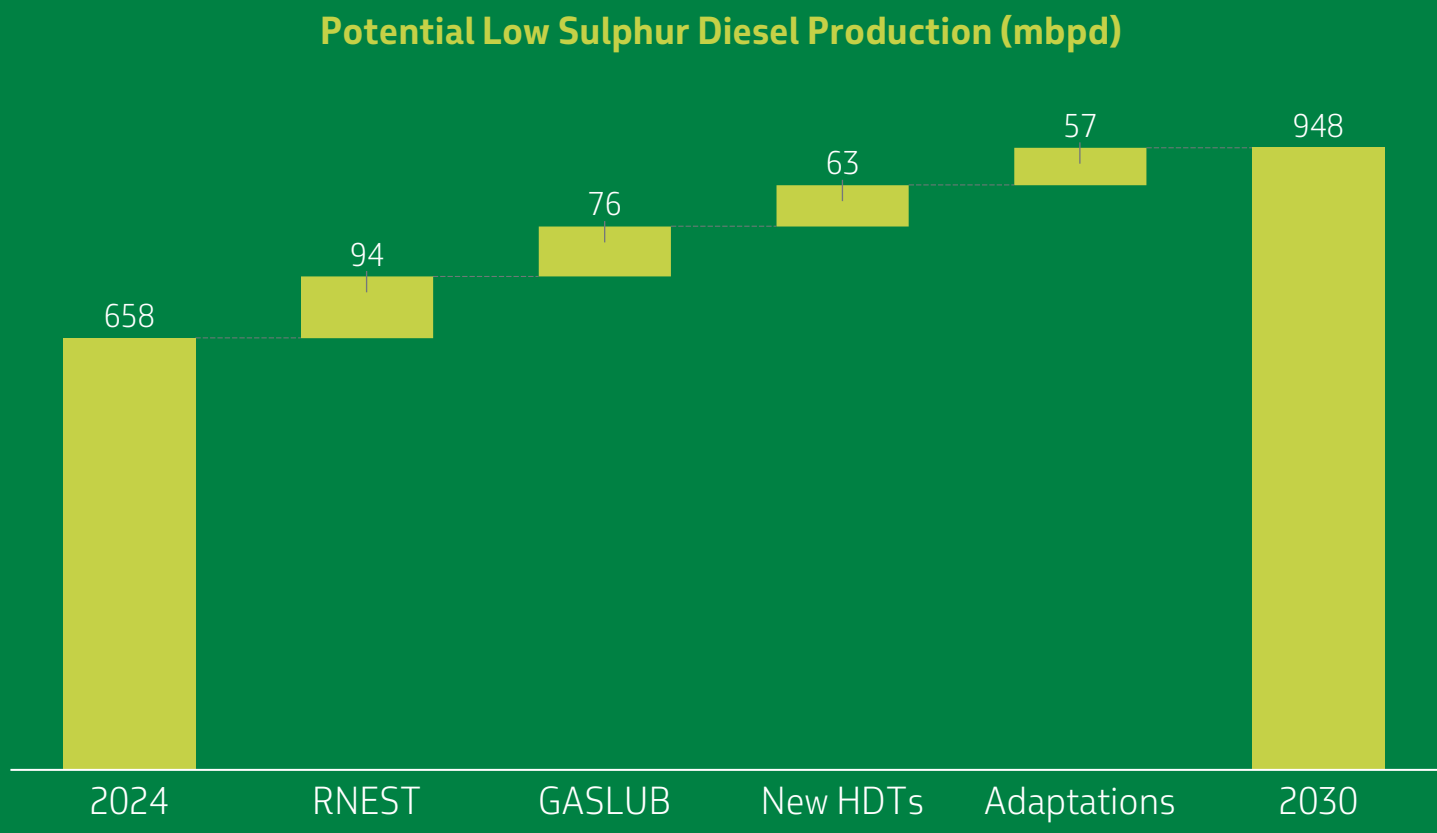
REPLAN's new HDT
Construction in progress
Operation in 2025

REVAP View

REVAP adaptation
Upgrade from S500 to S10
Contract already signed
Operation in 2026

We continue to assess new opportunities for improvements in our refineries, through an integrated and continuous planning process

Increase in ULSD production reflects Refining CAPEX



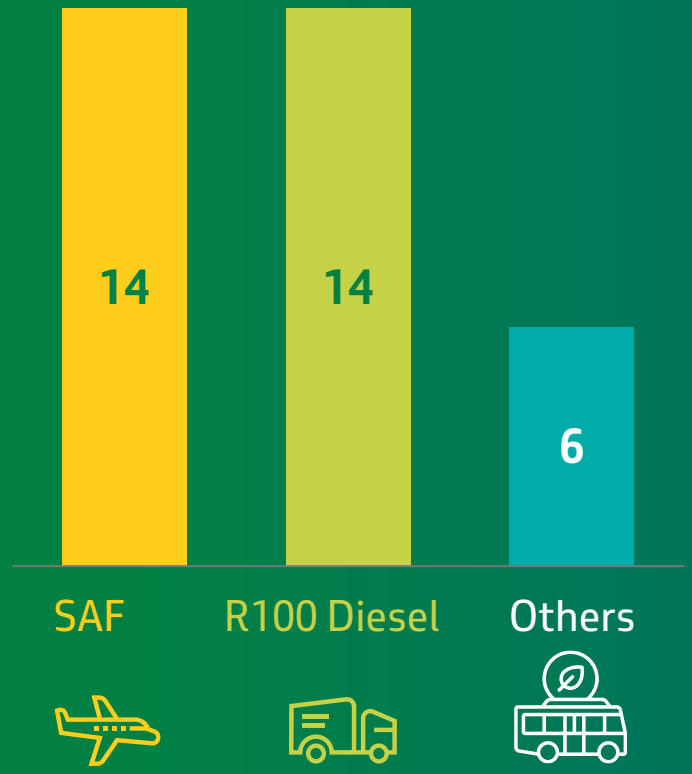
BioRefino Program

We will invest in dedicated plants for SAF and 100% renewable Diesel

DEDICATED PLANTS (2028+)

FLEXIBLE PRODUCTION*

kbpd



- SAF RPBC
  15 kbpd
- SAF GASLUB
  19 kbpd

Further initiatives:

- Third and fourth plant studies with different technologies
- Development of other oil products with renewable content
- Memorandum of understanding with Mubadala Capital to develop joint studies on future businesses

** Aligned to CORSIA - Carbon Offsetting and Reduction Scheme for International Aviation - demands*

Dedicated Plant at RPBC

- *First Petrobras' dedicated plant for the production of SAF and Renewable Diesel*
- *Production Capacity : 15 kbpd*
- *Estimated start date: 2029*

Refining, Transportation and Trading of the Future and New Technologies

Topics that are the focus of Petrobras' R&D Portfolio

1. Integrity and Reliability of E&P Assets
2. Decommissioning of E&P Assets
3. Future Geology for Improving Predictability
4. Production and Injection Efficiency in E&P Assets
5. Sustainable Geophysics in New Frontiers and Replenishing Reserves
6. Gas Efficiency and Competitiveness
7. Refining Asset Integrity and Efficiency (REFTOP)
8. SCC-CO2
9. Safety
10. Environment
11. Integrated Production Management
12. Future Production systems
13. Refining, Transportation and Trading of the Future
    - Decarbonization of operations
    - Products with higher value added
    - Integration with petrochemicals
    - Digitalization
    - Operational efficiency and energy performance
14. **Low Carbon Products**
15. CCUS
16. Wind and Solar Generation
17. Low Carbon Hydrogen

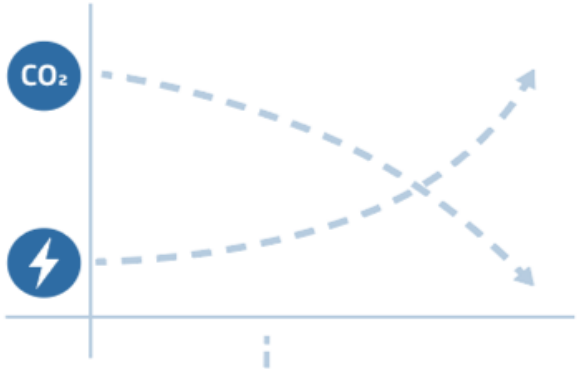
Redefining Refineries: Meeting the Demands of a Changing Energy Landscape

Electrification

Electrification with renewable sources for reducing refining carbon footprint

Decarbonization

Energy efficiency associated to CCUS and clean hydrogen production for refining applications and PtL and PBtL



Renewable Feedstocks Processing

Biofuels and biochemicals production integrated to oil refining

New Processes, Products and Markets

Integration with petrochemistry and advanced biofuels production

Digital Transformation

Digital Technologies for refinery optimization, molecular management and safe operation

PtL – Power-to-Liquid
PBtL – Power and Biomass-to-Liquid

Key Topics for Petrobras' R&D Portfolio

1. Integrity and Reliability of E&P Assets
2. Decommissioning of E&P Assets
3. Future Geology for Improving Predictability
4. Production and Injection Efficiency in E&P Assets
5. Sustainable Geophysics in New Frontiers and Replenishing Reserves
6. Gas Efficiency and Competitiveness
7. Refining Asset Integrity and Efficiency (REFTOP)
8. SCC-CO2
9. Safety
10. Environment
11. Integrated Production Management
12. Future Production systems
13. Refining, Transportation and Trading of the Future
14. **Low Carbon Products**
    - Biofuels Technologies
    - Green Chemistry in Refining and Petrochemistry
    - E-fuels and CO_2 conversion
    - Renewable raw materials
    - Performance and quality of renewable products
15. CCUS
16. Wind and Solar Generation
17. Low Carbon Hydrogen

Petrobras R&D: Technology solutions for low carbon products

BIOFUELS TECHNOLOGIES

*Technologies for **biofuels production** integrated to refining assets, including coprocessing, SAF, HVO, Bunker with renewable content and LCAF*

GREEN CHEMISTRY IN REFINING AND PETRO-CHEMISTRY

*Technologies for renewable feedstock **conversion to (petro)chemicals and biofuels***

E-FUELS AND CO_2 CONVERSION

*Technologies for decarbonization through **CO_2 conversion to e-fuels and chemicals***

RENEWABLE FEEDSTOCKS AND CIRCULAR ECONOMY

***Alternative and residual feedstocks** for biofuels production*

RENEWABLE PRODUCTS QUALITY AND PERFORMANCE

***Biofuels quality and performance** supporting insertion on fuels markets*

RESEARCH DEVELOPMENT AND INNOVATION RD&I

DEEP DIVE
PETROBRAS 2024

RTC Q&A session