



Brazil's opportunities outside the pre-salt

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Agenda

1. What opportunities are available outside the pre-salt?

2. Incremental projects as an option

3. Campos basin example

4. Case study - Peregrino

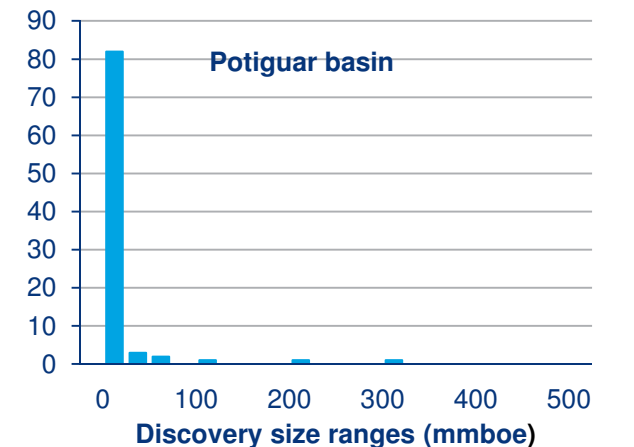
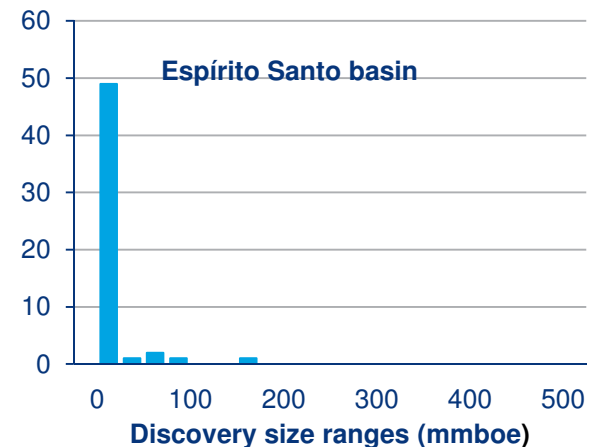
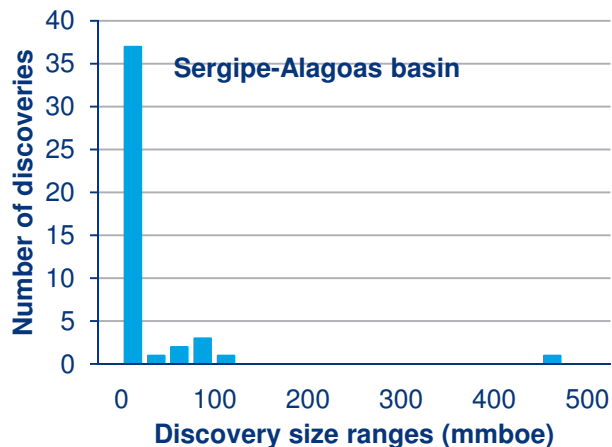
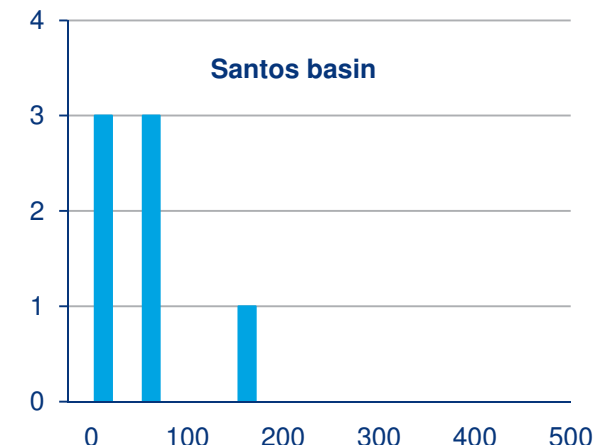
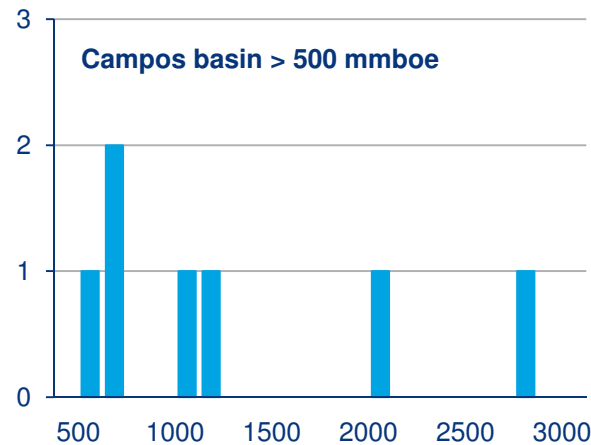
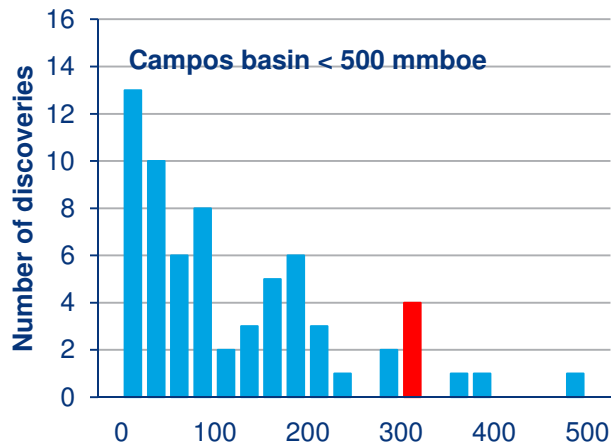
5. Key messages

What opportunities are available outside the pre-salt?

Typical discovery sizes are 50 – 200 mmboe

Discoveries over 300 mmboe are outliers – statistically rare

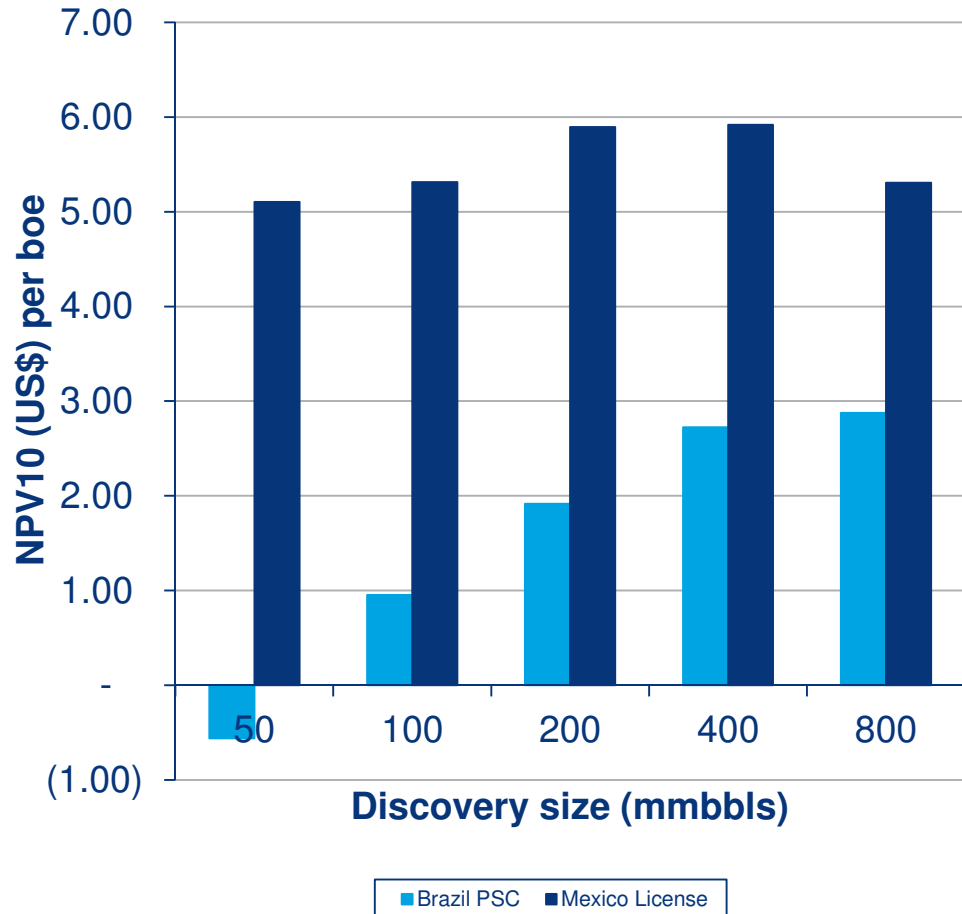
Discovery size distribution (mmboe), excluding Santos pre-salt



Regressiveness of Brazil fiscal terms punishes small discoveries

Mexico license terms – applicable to onshore and deepwater blocks – are much more progressive, offering more opportunities to develop small discoveries

NPV10 per boe for various discovery sizes @US\$60/bbl



Source: Wood Mackenzie
Fiscal Benchmarking Tool

Mexico's Round One deepwater phase results:

- 8 out of 10 blocks received bids, in addition to Trion JV with Pemex
- Diverse group of 15 companies placed bids including Majors BP, Chevron, ExxonMobil, ENI, Shell, Statoil and Total, Large Caps Anadarko and Inpex, Mid Cap Murphy and NOCs CNOOC, Pemex and Petronas as well as independents Ophir and Sierra
- Areas offered based on industry nominations
- Trion JV had maximum acceptable royalty, favoring competition through higher work commitments

General assumptions:

- Deepwater costs and production schedules were applied
- Brent price assumption of US\$60/bbl
- 30 mmbbl recoverable per well

Brazil specific assumptions:

- 20% bid in Brazil PSC
- Bid grid tiers recentered at \$50/boe with \$10 increment
- All bid grid offsets scaled from 41.65% to 20%
- REPETRO extended until 2040

Mexico specific assumptions:

- 10% additional Royalty bid

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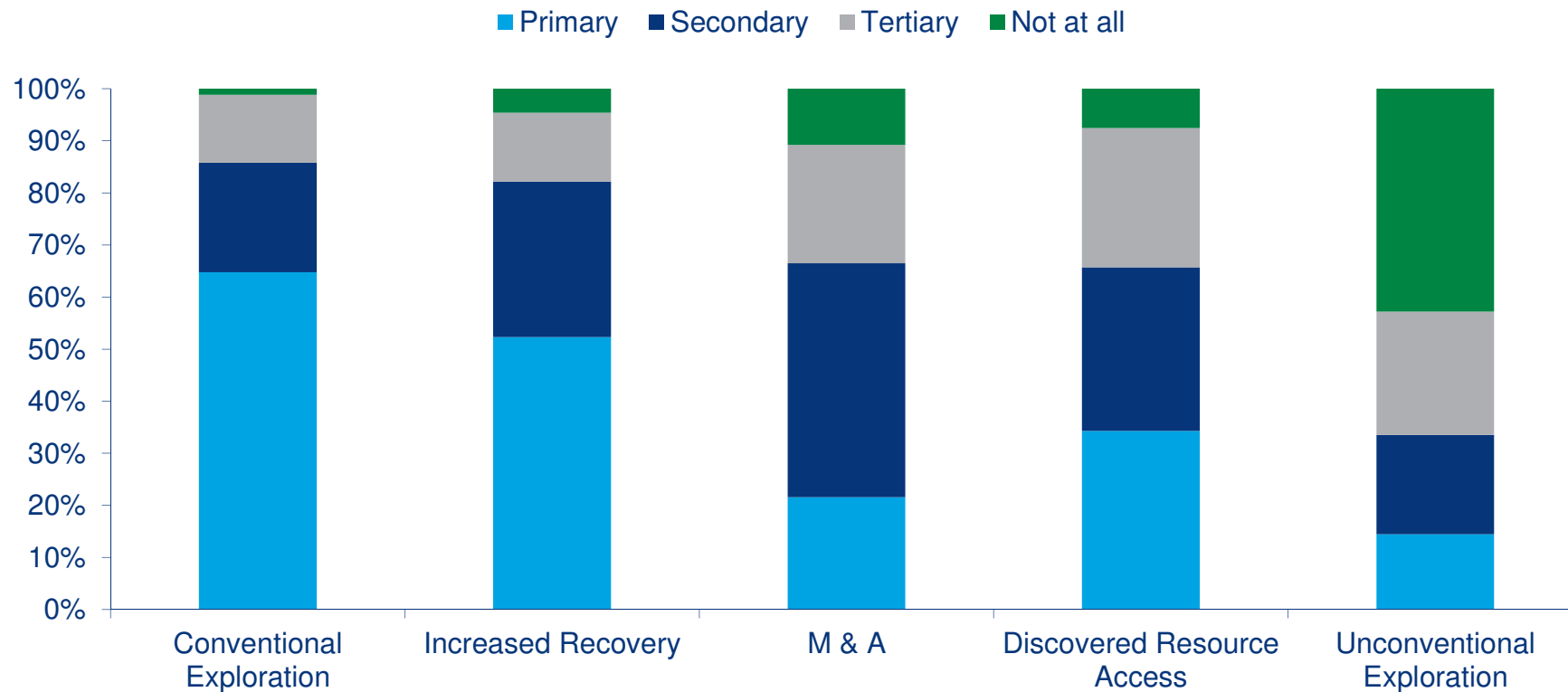
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Increased recovery rank as one of the preferred options for resource capture

We surveyed 200 senior exploration leaders and professionals to understand how they see the exploration industry evolving as it shows signs of recovery

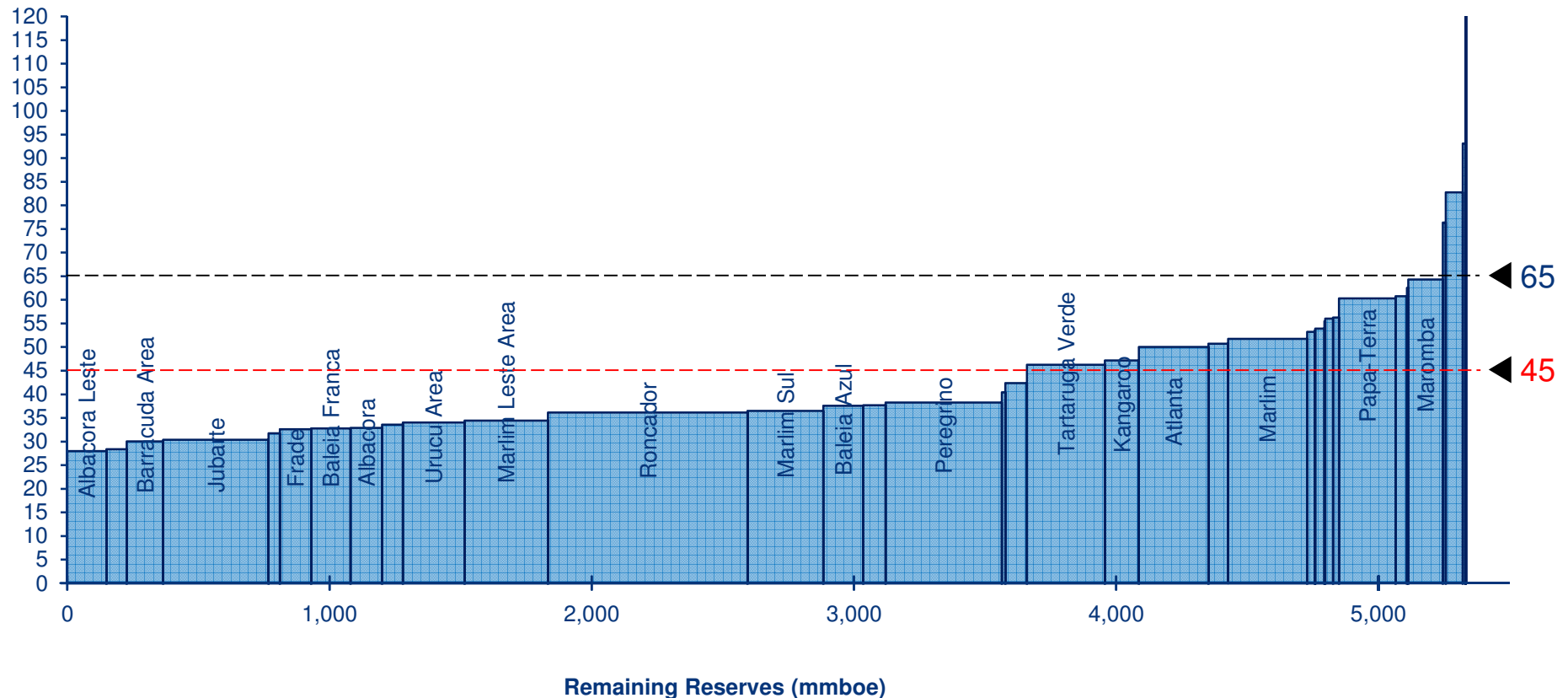


*Download the full survey results: <https://www.woodmac.com/ms/upstream/the-future-of-exploration-is-the-industry-still-poised-for-a-recovery/>

Under Wood Mackenzie long-term Brent price assumption most post-salt sanctioned and on production projects are economical

In a US\$45/bbl scenario sanctioned and justified for development projects are at risk

Point-forward Breakeven Brent Price (US\$/bbl discounted @ 10%) vs Reserves



Source: Wood Mackenzie

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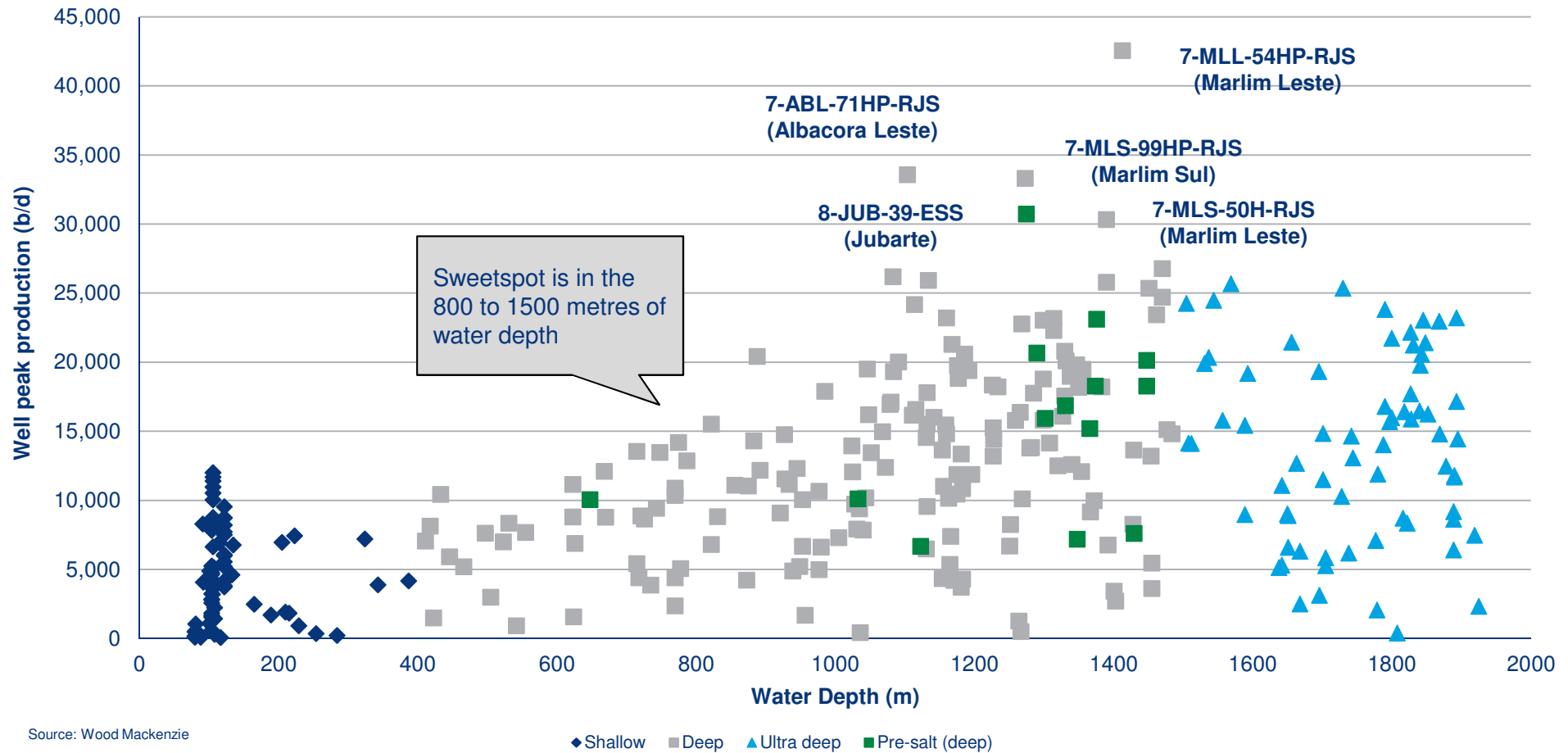
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The Campos basin offers all size of opportunities, including very productive post- and pre-salt deepwater wells

The Late Cretaceous sub-play (deep water) is the most productive in Campos

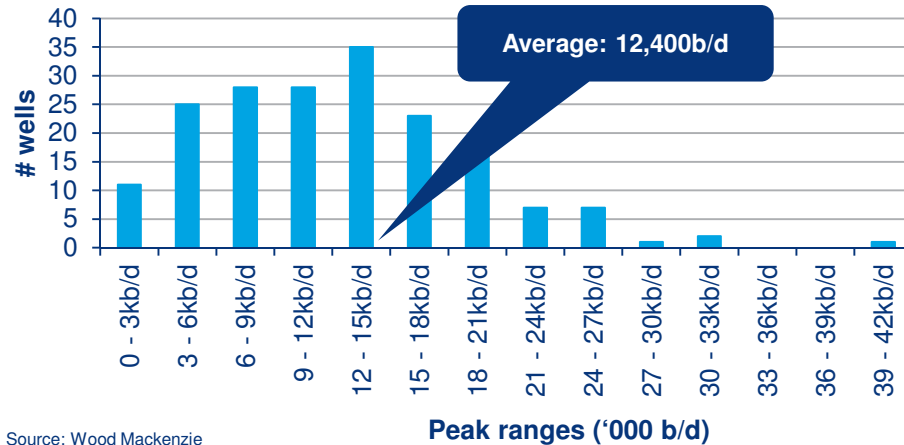
Distribution of well peak production rates by water depth in Campos basin



Source: Wood Mackenzie

Campos basin deepwater single well economics displays results favourable to the addition of tie-backs where spare capacity exists

Distribution of peak rates



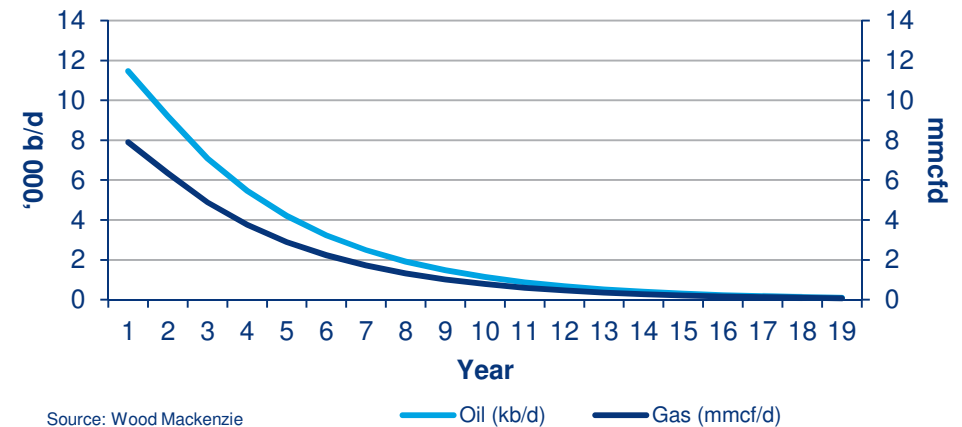
Source: Wood Mackenzie

Type well inputs

Drilling Capex (development well)	mmUS\$ 45
Drilling Capex (injection well)	mmUS\$ 31.5
Subsea Capex	mmUS\$ 30
Variable Opex	8 US\$/bbl

IP (average)	12,4kb/d
Well life	19 years
EUR	19.8mmboe
GOR	689 scf/bbl

Type curve



Source: Wood Mackenzie

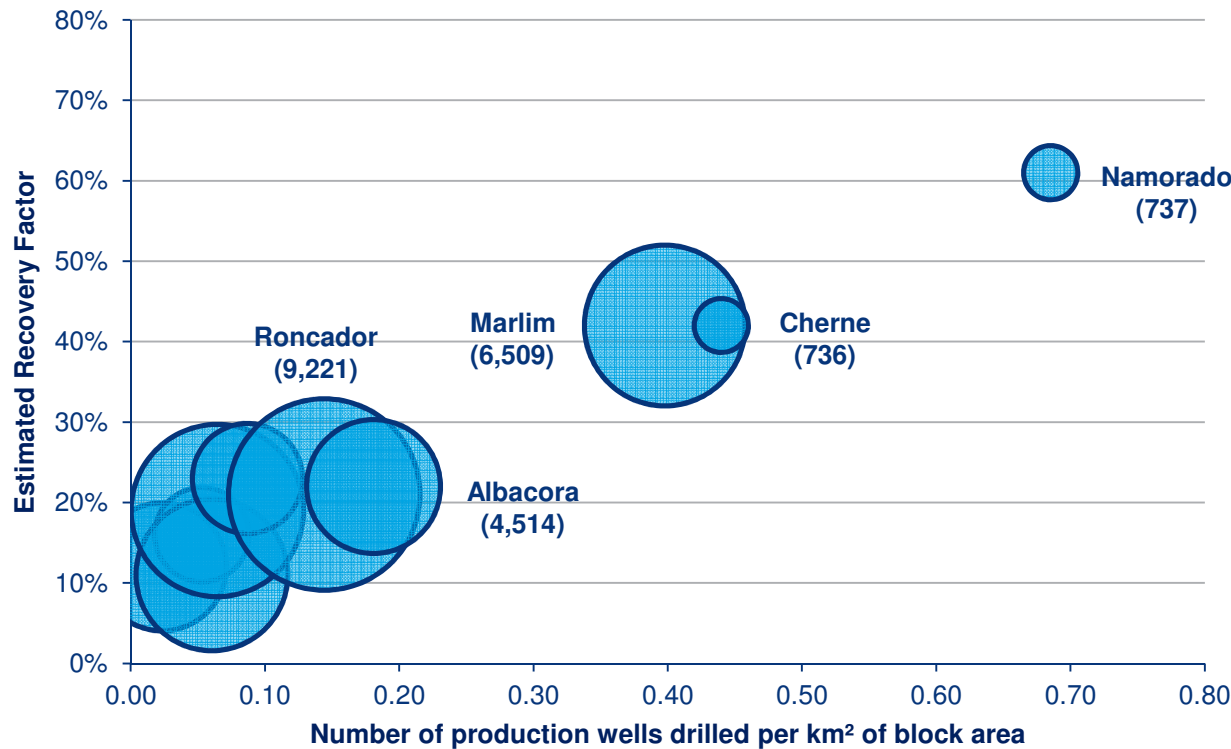
Type Well Economics

Post-tax PV10	mmUS\$ 313.2
Post-tax IRR	89.50%
Payback	2 years
Profitability index (P/I)	4.0
Brent oil price	65 US\$/bbl
Gas price	1.5 US\$/mcf

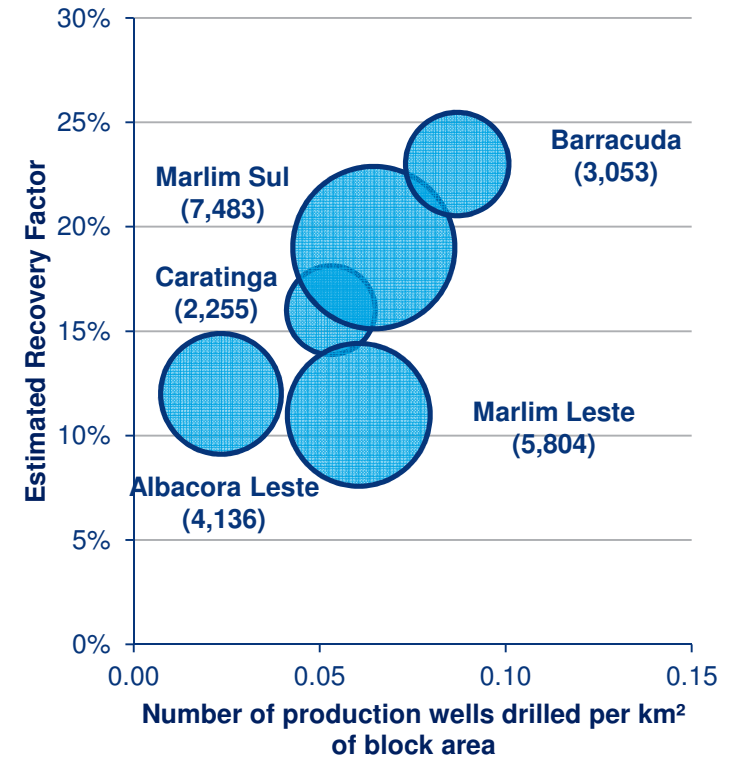
Well spacing and recovery factors shows a strong correlation, a preliminary indication for infill drilling opportunities

Original Oil in Place and recovery factors does not demonstrate the same relationship

Well spacing against recovery factors

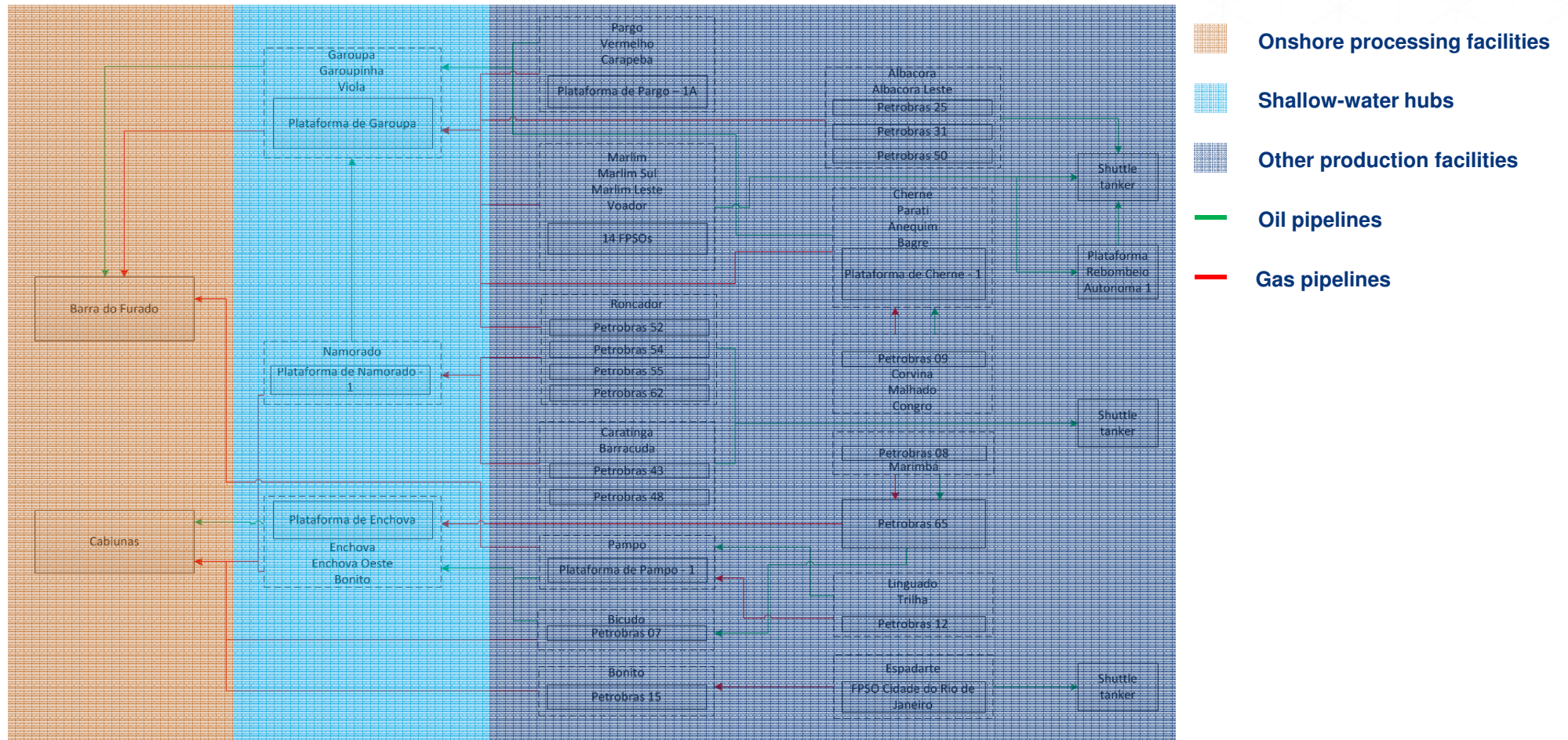


Source: Wood Mackenzie



*Bubble size indicates Original Oil in Place (mmbbl)

Open access to the pipeline infrastructure is a key factor to attract new players to the Campos basin



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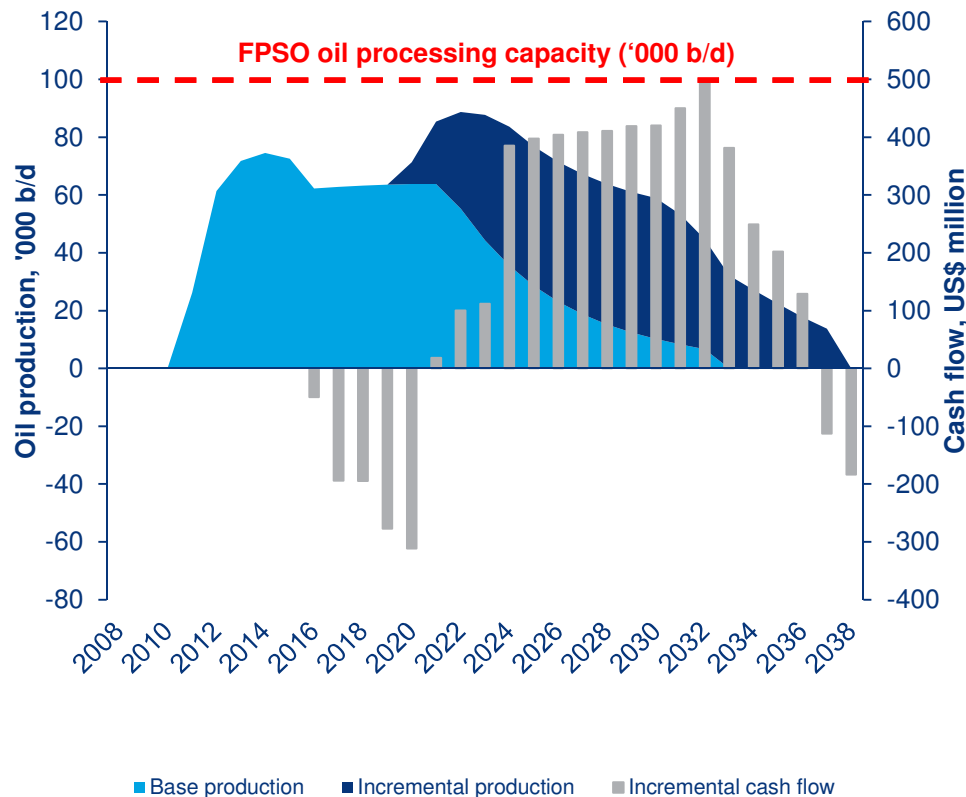
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Case study – Peregrino area (near-field exploration)

Incremental investment will generate an NPV10 of over US\$760 million, with an IRR of over 17%

Incremental production and cash flow



Source: Wood Mackenzie
Global Economic Model (GEM)

Key Facts

Volume growth from southwest extension of Peregrino's reservoir not reached by Phase I wells and near-field discovery Peregrino Sul

- **FID:** 2016
- **Costs:** US\$2.8 billion capex budget (2017 real terms)
- **Expected start-up:** 2020
- **Licence expiry:** 2033

Rationale

- Phase I performance indicates recoverable reserves at the low end of initial estimates (345 mmbbl)
- Additional prospects identified near the main producing area
- Southwest extension and near-field discovery will be produced by the addition of a third fixed platform and take advantage of the spare capacity in the FPSO.
- Carbonate targets and prospects to the north of the field represent further upside

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Opportunities do exist, incremental production projects appear as an alternative to exploration

- ◆ Initiatives to make Brazil fiscal terms more progressive and to reduce operational obligations are a step in the right direction to foster a more diverse industry
- ◆ Incremental production from on production fields is a short and medium term low-cost opportunity to add reserves and production
- ◆ Campos basin single well economics and opportunities for infill drilling justify the investment
- ◆ The Peregrino – Phase II development demonstrates the good potential that incremental projects represent

Contacts

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