

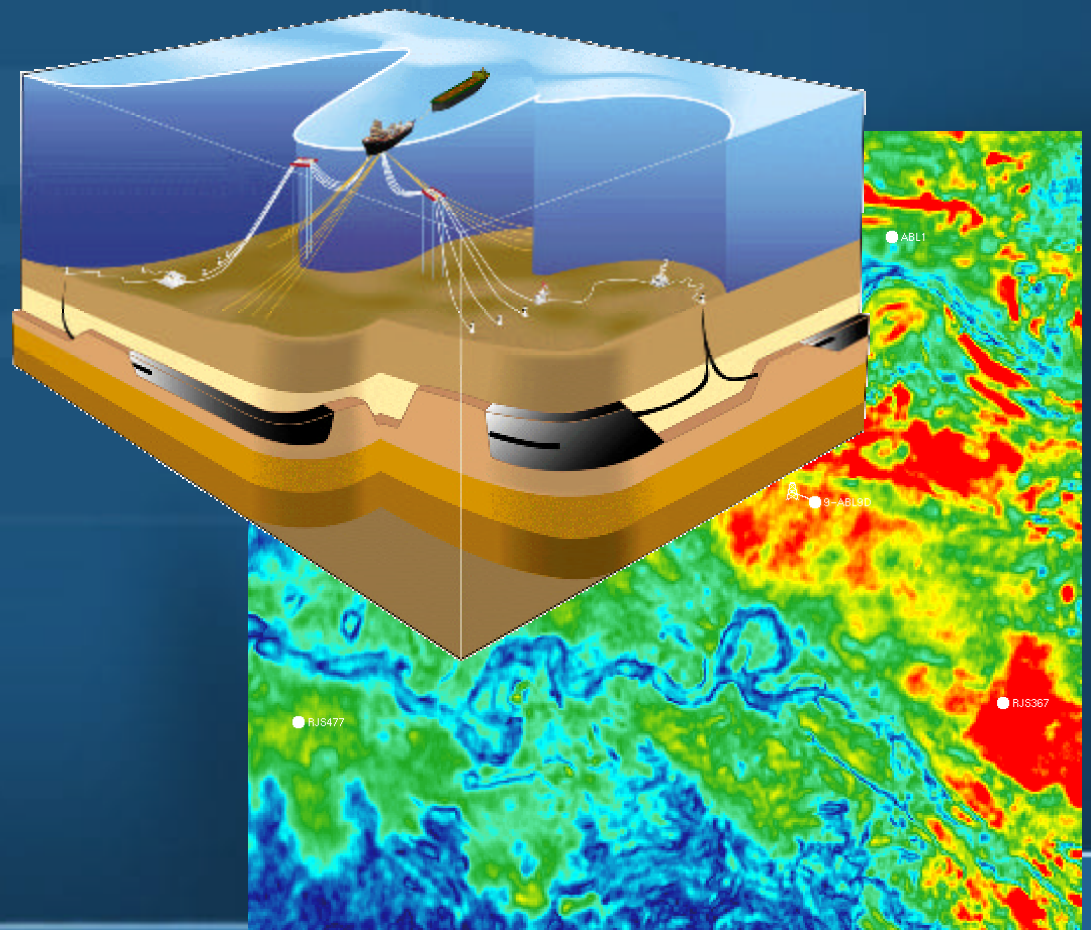


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How Much Oil and Gas from Deepwater? The Brazilian Experience

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**IV International Workshop
on Oil and Gas Depletion
19-20 May 2005
Lisbon, Portugal**





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Presentation Outline

- 1. From Onshore to Deep Water Exploration and Production**
- 2. Technological Challenges for Developing Deep Water Fields**
- 3. Assuring Increasing Petroleum Production and Reserves in Brazil**
- 4. Conclusions**



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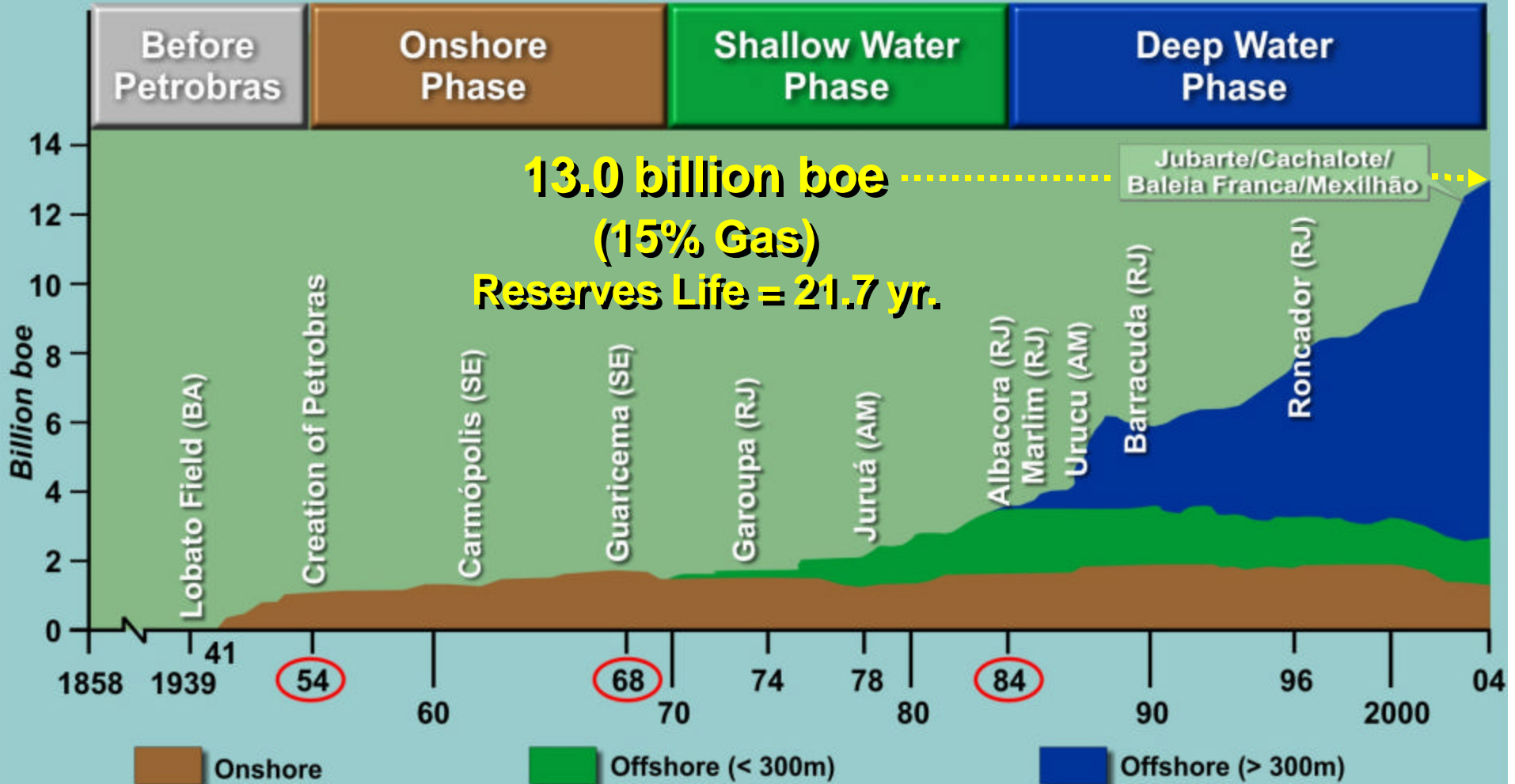
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Evolution of Proven Reserves





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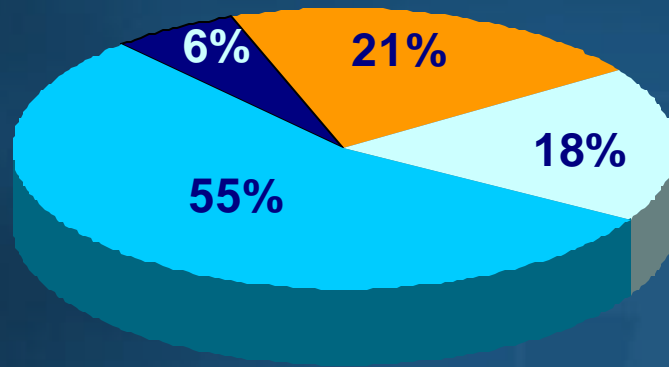
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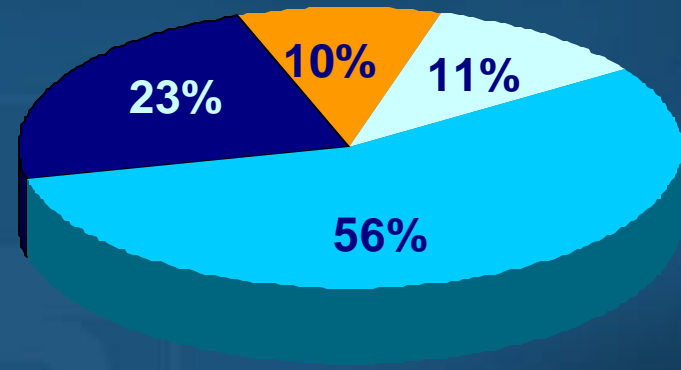
E&P Profile

2004 Production



1.758 million boepd

2004 Proven Reserves (SPE)

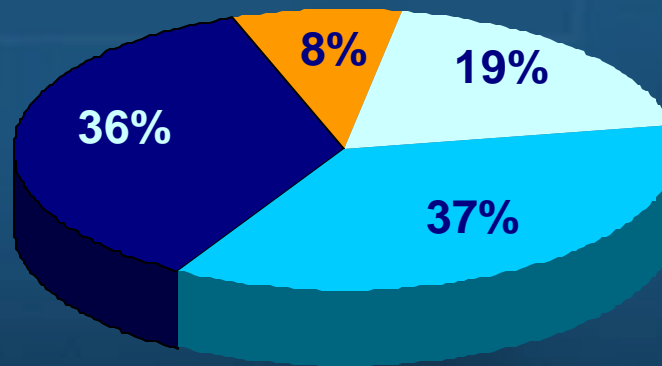


13.02 billion boe



Current Exploratory Area

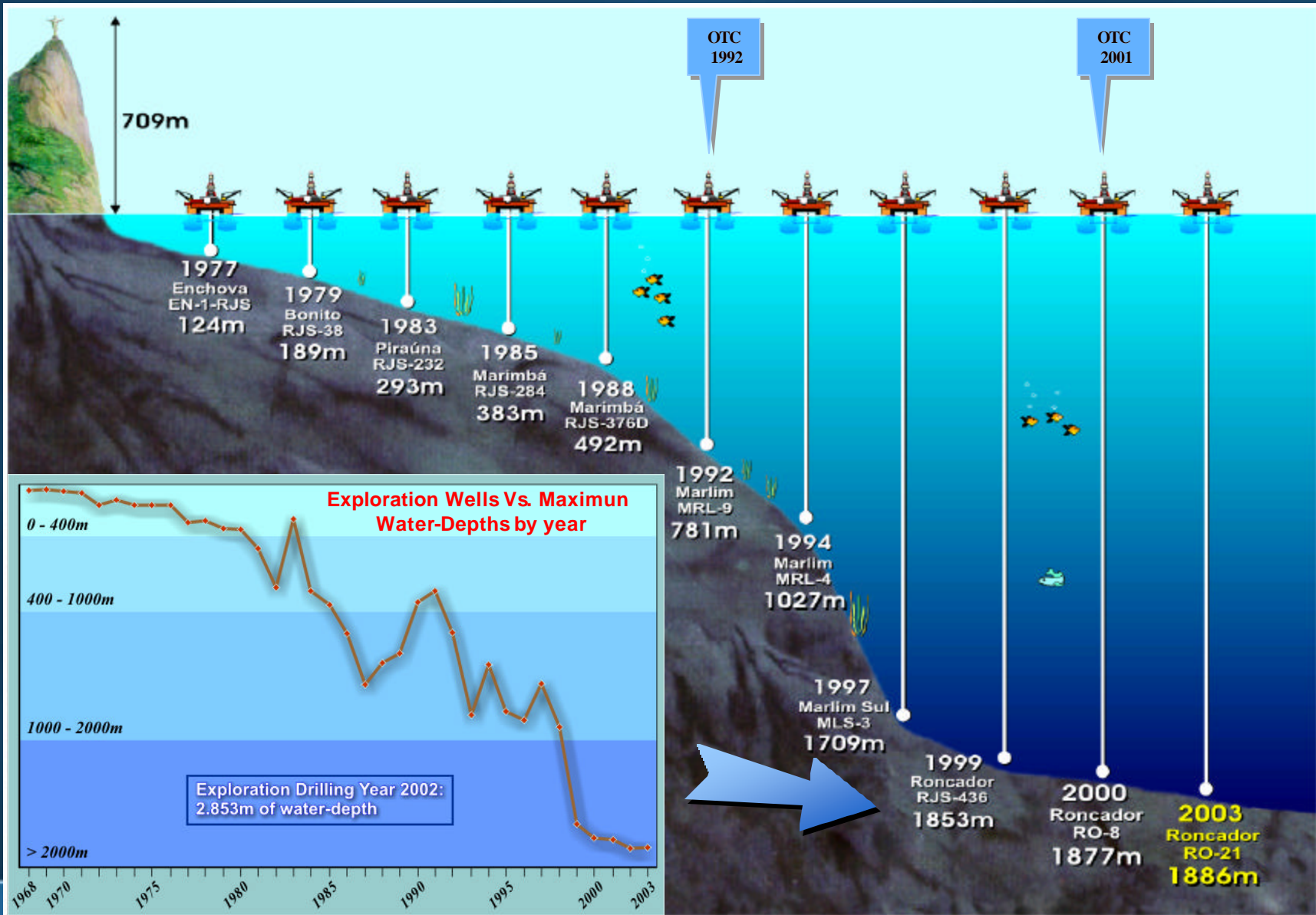
~150.000 km²





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Records in Completion/Production and Exploration Drilling Offshore





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The development of deep and ultra-deep water fields has continuously provided new challenges ...

**... these fields must be developed with fewer wells,
high-productivity (>10,000 – 15,000 bopd) wells,
horizontal or highly-deviated wells,
drilled into poorly-consolidated reservoirs.**



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Development of Deep-Water, Heavy Oil Fields

**Large volumes in deep- and
ultra-deep water Campos Basin
(STOIP > 16 billion bbl,
< 19 °API,
> 10 cp @ reservoir conditions)**

New production technologies:

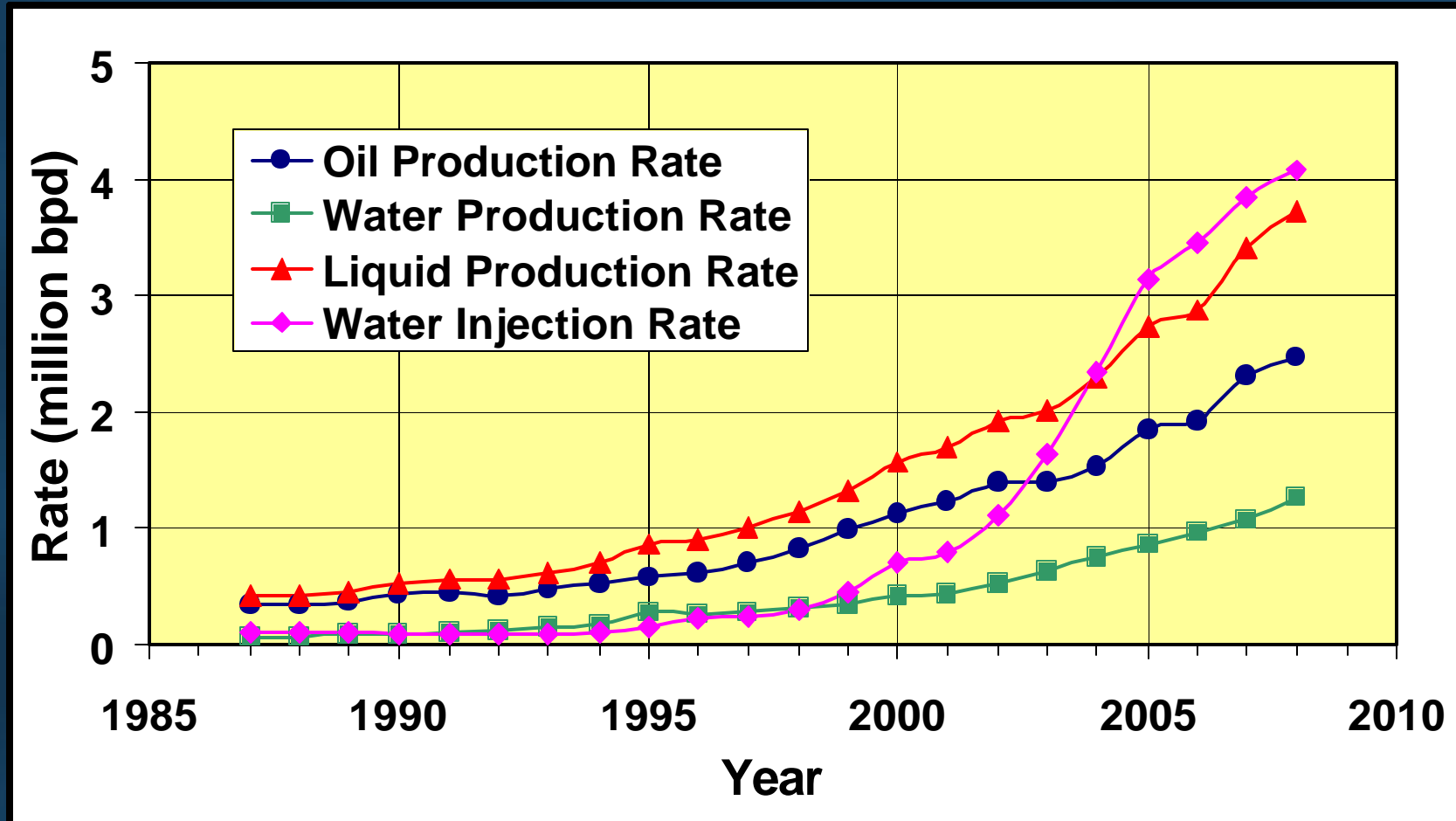
- long, horizontal or multilateral wells**
- reliable, high rate artificial lift devices**
- efficient heat management systems**
- compact oil-water separation systems**

**Oil production in the recently-discovered Jubarte field:
1,076 m long horizontal well ® 22,000 bopd
17 °API, 14 cp @ reservoir conditions**



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Oil Production and Water Management



- Challenges:
- Ⓜ Water injection (volume, quality and distribution)
 - Ⓜ Disposal of large volumes of produced water
 - Ⓜ Scale and souring prevention and remediation



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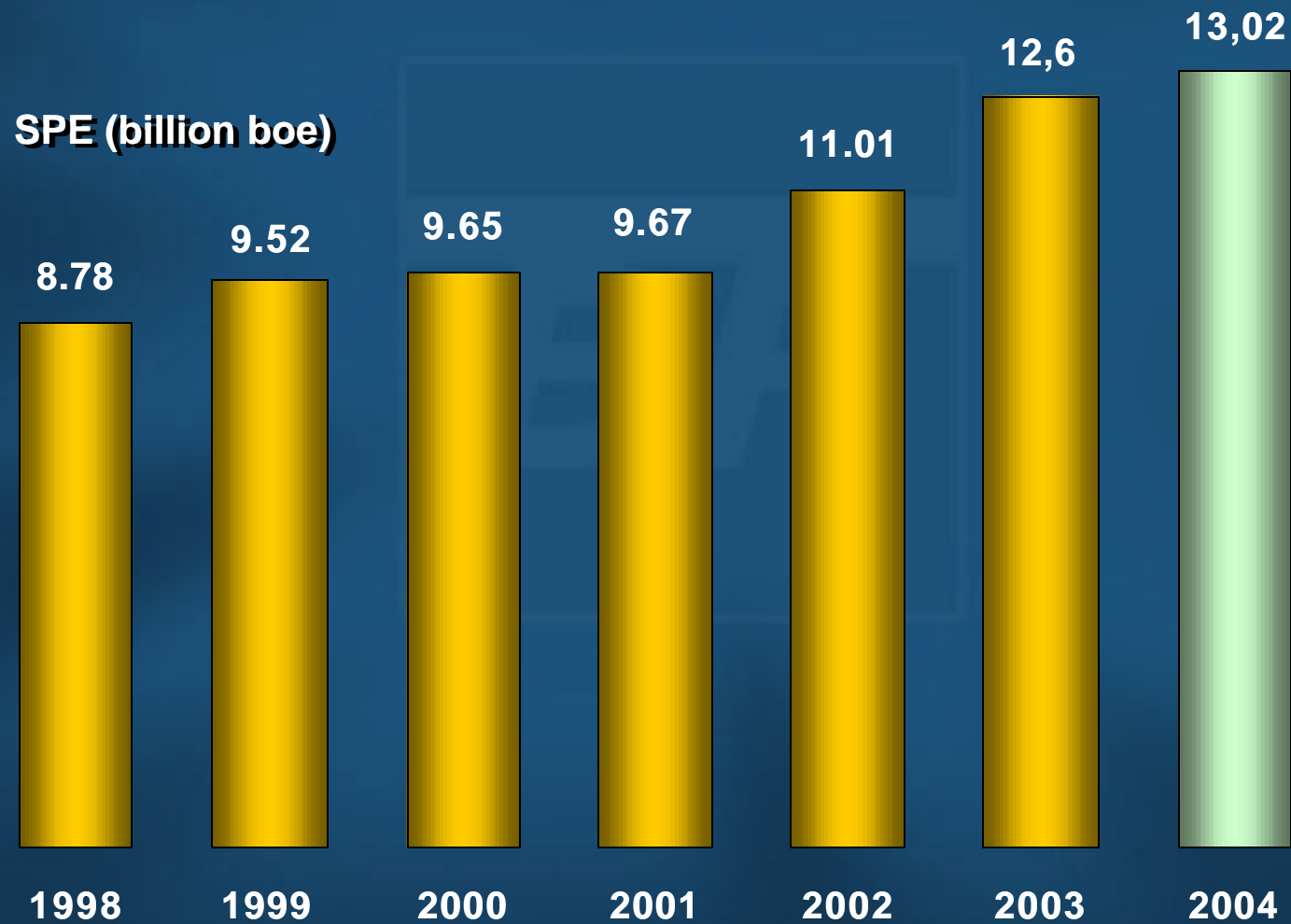
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Evolution of Proven Reserves

2001 [®] 2004: + 3.35 billion boe (35%)

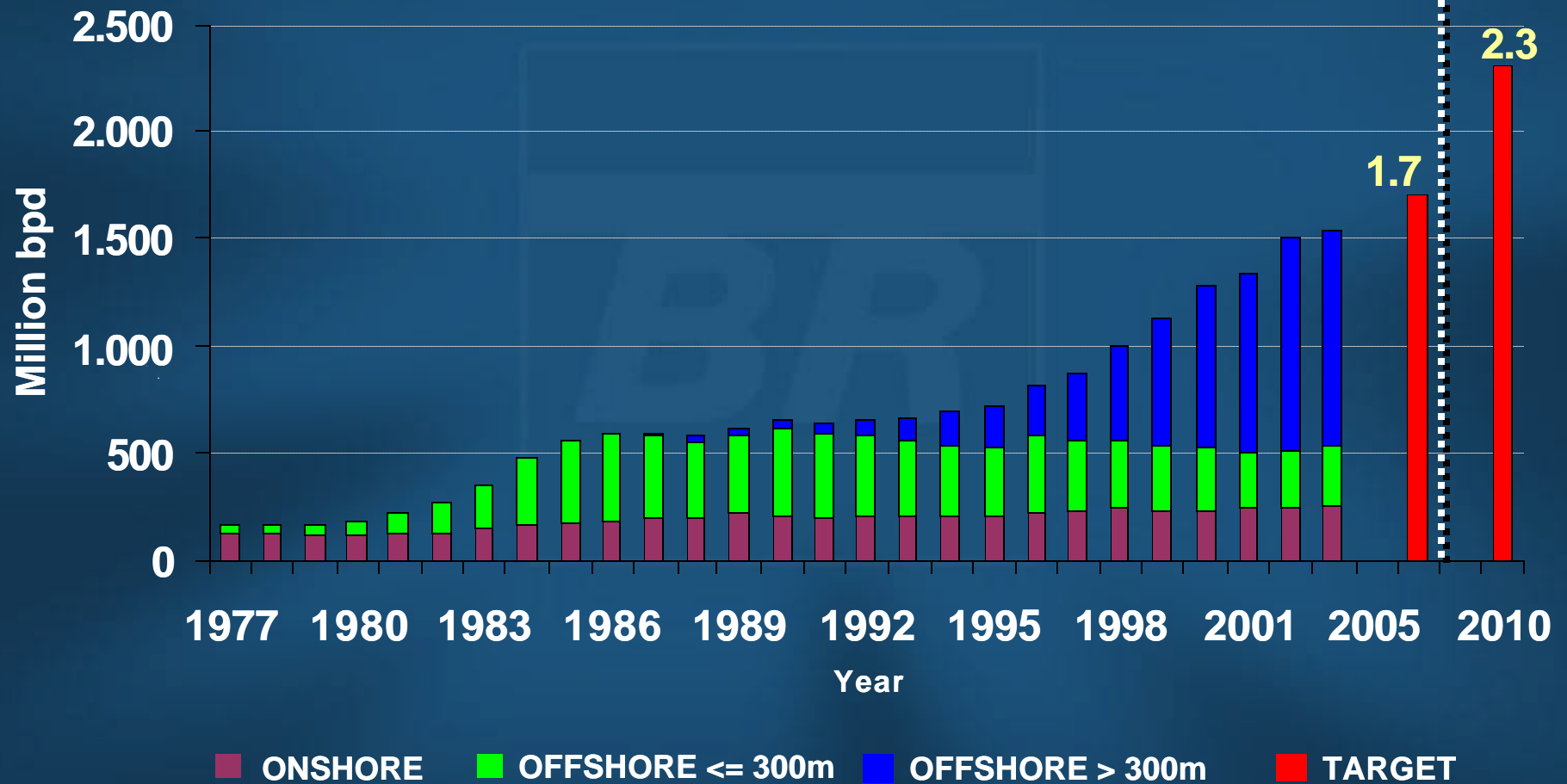




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Evolution of Oil Production and Target

Brazilian self-sufficiency in 2006 (1.9 million bopd)





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Petrobras Exploratory Concessions
~150.000 km²
(73% Deep & Ultra-Deep Waters)

Concession Areas
(August/2004)



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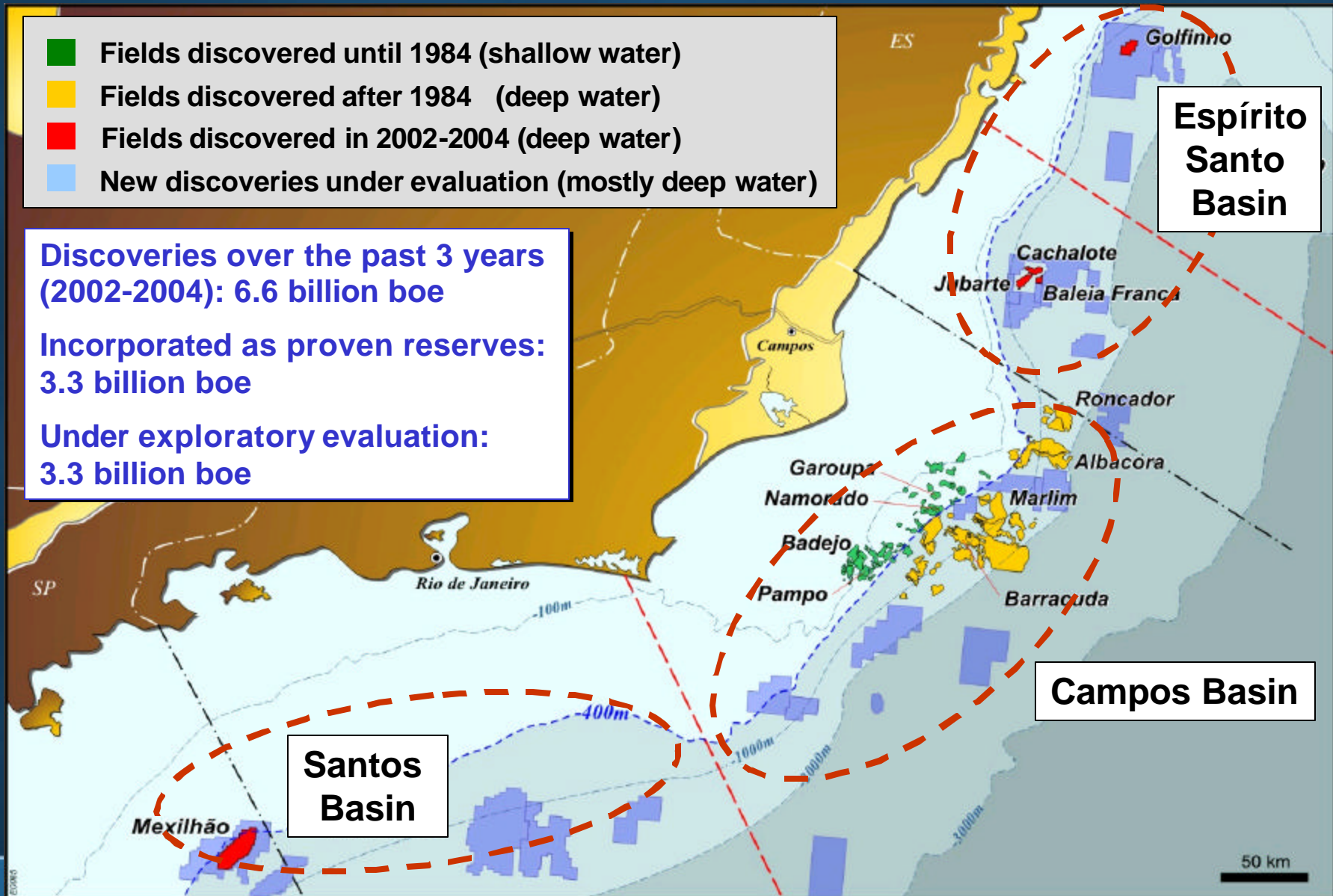
Important New Petroleum Provinces

- Fields discovered until 1984 (shallow water)
- Fields discovered after 1984 (deep water)
- Fields discovered in 2002-2004 (deep water)
- New discoveries under evaluation (mostly deep water)

Discoveries over the past 3 years (2002-2004): 6.6 billion boe

Incorporated as proven reserves: 3.3 billion boe

Under exploratory evaluation: 3.3 billion boe



Espírito Santo Basin

Campos Basin

Santos Basin

50 km



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Conclusions (1/3)

- ① Since 1968, when offshore exploration started, Petrobras continuously moved to aggressive exploration and production in deep and ultra-deep waters.
- ① Deep and ultra-deep water reservoirs are responsible for 61% production (1.1 million bopd), 79% proven reserves (10.3 billion boe), 73% exploratory portfolio (110.000 km²). Their importance will keep growing ...



Conclusions (2/3)

- ① **The development of deep and ultra-deep water fields has continuously provided new challenges for reservoir characterization and management:**
 - **fields must be developed with few, horizontal, and high-productivity wells, drilled into poorly consolidated reservoirs,**
 - **large volumes of heavy and viscous oil (< 19 °API, > 10 cp @ reservoir conditions),**
 - **handling of large volumes of injected- and produced water.**

- ② **Continuous investment in R&D to make possible production of new discoveries in water depths up to 3,000 m.**



Conclusions (3/3)

- ① **To assure the historical trend of increasing petroleum production and reserves in Brazil:**
 - **strengthen expertise in deep and ultra-deep waters,**
 - **produce oil and gas from onshore and shallow-water fields with focus on profitable opportunities,**
 - **implement practices and new technologies in areas with high exploitation degree in order to optimize recovery factor,**
 - **developing exploratory efforts in new frontiers.**

- ② **Recent, large discoveries outside the very prolific Campos Basin (Santos, Espírito Santo, Sergipe-Alagoas ...) make very difficult to forecast when petroleum production and reserves will peak in Brazil.**



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Thank You !
Muito Obrigado !