National Oil Companies
Performance and Strategy

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Geological Opportunity, Investment Risk

Brazilian Experience

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From On-Shore to Off-Shore

- 1954: Petrobras (on-shore disappointment)
- 1974: First off-shore discovery (Garoupa)
- Economic context
  - 80% of domestic consumption imported
  - No market risk (monopoly of Petrobras)
  - Oil price escalation
  - New technologies available (North Sea)
- Off-shore production: 392 thousand b/d (1985)
Oilfields Discovered (Southeastern Basins)
TO DEEP OFF-SHORE

- Giant fields (300m to 2100m): Marlim / Albacora
- Higher complexity, higher risk; higher premium
  - Petrobras decided to take the risk (!)
- Challenges
  - Geology
  - Technology
  - Financing
Geological Challenge

- Development of geological capacity
  - Models available centred on carbonate formations
  - New models for understanding turbidite formations
  - Modeling of the Brazilian platform

- Geological Strategy
  - Training (1300 geologists/10000 engineers)
  - Learning by doing
Technological Challenge
Typical Deepwater Project: Semi-submersible + FPSO
Technological Strategy

- **Incremental innovation (until 1984)**
  - 1960/1980: acquisition and assimilation of technologies
  - 1980/1990: adaptations and absorption of design
  - 1990/2000: joint R&D; knowledge production
  - 2000: joint R&D; technology exchange; specialized knowledge production

- **Radical innovation**
  - Procap 1000
  - Procap 2000
  - CENPES plataform design: 30% cost reduction

- **1992**: Distinguished Achievement Award (OTC)
TECHNOLOGIES

- Wet christmas tree (200m)
- Flexible risers
- Robotics (over 300m)
- New anchors (plastics)
- New technologies for liquid flow
- Horizontal hole
- Drilling mud
- Resistance of drilling equipment
- Conversion of ships
- Automation of plataforms
Financial Strategy

- Early production systems (Sedco-Hamilton)
  - Drilling equipment removed
  - Replaced by small processing plant

*Anticipate cash flow*

- Opposition inside Petrobras (GECAM)
  - Special Group for Enchova
  - From 1977 to 1984: 17 EPS
Recent Exploration Investments

Accumulated investments
1954/2005: US$ 21 billion

US$ 1.12 billion/y
US$ 1.53 billion/y

US$ 536 billion/y
US$ 880 billion/y
Oilfields Discovered (Southeastern Basins)
Reserves Evolution (oil and gas)
Exploratory Strategic Move

- Leaving the shallow Tertiary reservoirs, as a major exploration target, with heavy oil prospects
- Going deep to Cretaceous sandstone and Albian carbonate reservoirs,
- Later going deeper into the pre-salt reservoir prospects
- **New Oil and Gas emerging provinces**
Recent Exploration Results

- *Discoveries in the last 4 years*
  - 8 billion boe
  - 40% heavy oil
  - 25% light oil
  - 35% gas (16 Tcf)
Production Targets

Oil and Natural Gas (Thousand boed)

2003 2004 2005 2006

2,036 2,020 2,217 2,298

7.9% p.a.

3,493

8.7% p.a.

4,556

278 742 724 2,812

Target 2011

2015 Forecast

Oil and NGL - Brazil
Natural Gas - Brazil
Oil and NGL - Internacional
Natural Gas - Internacional
E&P Companies in Brazil

58 companies in Brazil, being 27 Petrobras partners

- Petrobras Partners in Jan/2007

- Majors and NOCs
  - ENI, Exxon, Chevron, Total, Statoil, Hydro, Petrobras, Shell, RepsolYPF, Ecopetrol

- Independents
  - Amerada Hess, Anadarko, BG, Devon, El PAso, Encana, Hocol, Newfield, Maersk, ONGC, Petrogal, Queiroz Galvão, Koch, Inpex, SK, Partex

- Small Companies

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CONCLUSION

- In 30 years Petrobras moved from the periphery to the major league
- Strategy
  - Explore geological opportunity
  - Create in-house technological capability
  - Cooperation with IOC and suppliers
  - Innovation management customer oriented (!)
  - Financial freedom
- Incentives
  - International prices
  - Taxation
  - Risk mitigation
I am grateful to Petrobras for figures and interview
Brazilian Exploration Areas

- Sedimentary basins
  - 29
  - 6 MM km²
- Coastline: 7370 km

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Santos Basin: Pre-salt Exploration

Mexilhão ---BS-500--- ----------------Cluster-------------------

Water Depth 2000 m

Salt

targets

2 km