Sergipe Alagoas Basin
Geologists Marcos André Rodrigues Alves and Gustavo Santana Barbosa
Location and Characterization
Infrastructure and Operational Conditions
Exploration Overview
Tectonostratigraphic Evolution
Petroleum Systems
Plays
Area on Offer
Final Remarks
- Northeast of Brazil – Sergipe and Alagoas States
- Total Area: 44,370 km²
  Onshore area: 12,620 km²
- Mesozoic Basin
- The onshore portion is classified as mature
Location and Characterization

Northwest Boundary: Basement Extensional Faults

Northeast Boundary: Maragogi High

Southwest Boundary: Estancia Platfform and Vaza-Barris Fault

Boundary between sub-basins: Jaboata-Penedo High (onshore and shallow water)
80 Blocks
Sergipe-Alagoas Basin
Total Area: 2,418.77 km²

Location and Characterization

Legend:
- Capital
- Sectors Round 12
- Blocks on Offer - Round 12
- Sedimentary basins

Sergipe-Alagoas Basin
Total Area: 2,418.77 km²

Blocks on Offer
Round 12

SSEAL-T2
SSEAL-T3
SSEAL-T4
SSEAL-T5

Pernambuco
Alagoas
Sergipe

Maceió
Araçaju
Location and Characterization

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Area on Offer

Final Remarks
Infrastructure and Operational Conditions

- 4 Refineries
- 3,821 km of pipelines
- 7 Natural Gas Processing Poles
- Natural Gas processing capacity in the region: 24 million m³/day

Legend:
- Capital
- Sectors Round 12
- Blocks on Offer - Round 12
- Sedimentary basins
- NGPP
- Oil Pipelines
- Gas Pipelines
- Refineries
- Refineries under Construction
Infrastructure and Operacional Conditions

Legend:
- Capital
- Sectors Round 12
- Blocks on Offer - Round 12
- Sedimentary basins
- Highways
- Railways
- Ports
- International Airports
- Regional Airports
Location and Characterization
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Final Remarks
• **Beginning: Geophysical Surveys by CNP – Petroleum National Council (1935)**
National Bid Rounds:
R2, R4, R6, R7, R10 and R11

Under concession: 10 blocks
- Onshore: 01 block under concession + 11 auctioned blocks at R11
- Offshore: 09 blocks

Onshore operator:
Integral de Petróleo e Gás do Brasil
**Alagoas Sub-basin**

18 Production/Development Fields

- 17 Onshore
- 1 Offshore

10 oil fields

7 gas fields

1 oil and gas field

**Sergipe Sub-basin**

38 Production/Development Fields

- 29 Onshore
- 9 Offshore

37 oil fields

1 oil and gas field
Evolution of Total Reserve (Onshore)

Total Reserve of Oil (Onshore)

- Sergipe Sub-basin: 20%
- Other basins

Average Production (dec/2012):
- Oil: 5,000 bbl/day
- Gas: 1.8 Million m³/day

Source: Anuário Estatístico Brasileiro do Petróleo, Gás Natural e Biocombustíveis, 2012
Available Data

- 38,715 km onshore 2D lines
- 1,155 km² onshore 3D lines
- 57,910 km offshore 2D lines
- 8,278 km² offshore 3D lines
Sergipe Sub-basin: 770 Exploration Wells
(511 onshore and 259 offshore)

Alagoas Sub-basin: 362 Exploration Wells
(316 onshore and 46 offshore)
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**Tectonostratigraphic Evolution**
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Tectonostratigraphic Evolution

SEQUENCES

Regressive Drift

Transgressive Drift

Rift

Pre-Rift

Paleozoic Synclise

Basement

Source: ANP/UFRN/FUNPEC, 2008
Tectonostratigraphic Evolution

Basement
Proterozoic

Sergipe Sub-basin
Sergipana Belt
Metamorphic

Alagoas Sub-basin
Pernambuco-Alagoas
Massif
Granitic

Source: ANP/UFRN/FUNPEC, 2008
Paleozoic Synclise

**Early Permian (Aracare Fm.)**
*Desertic and coastal*

**Late Carboniferous (Batinga Fm.)**
*Subaqueous Glacial diamictites associated with fluvial sediments*

Source: ANP/UFRN/FUNPEC, 2008
Tectonostratigraphic Evolution

Pre-Rift Jurassic

Bananeiras and Candeeiro Fm.  
Fluvial-deltaic/ Lacustrine

Source: ANP/UFRN/FUNPEC, 2008
Rift
Early Cretaceous
Coruripe Group

Muribeca Fm.
Pocao Fm.
Coqueiro Seco Fm.
Maceio Fm.
Rio Pitanga Fm.
Penedo Fm.
Barra do Itiuba Fm.
Serraria Fm.

Source: ANP/UFRN/FUNPEC, 2008
Tectonostratigraphic Evolution

Rift
Early Cretaceous
Coruripe Group

Fluvial-Deltaics, Alluvials and Lacustrine

Source: ANP/UFRN/FUNPEC, 2008
Transgressive Drift
Neoaptian to Turonian
Sergipe Group

Cotinguiba Fm.
Neritic to superior bathyal

Riachuelo Fm.
Carbonate Platform of shallow waters

Source: ANP/UFRN/FUNPEC, 2008
Tectonoestratigraphic Evolution

Regressive Drift
Santonian to Recent
Piacabucu Group

Calumbi Fm.
Deep Marine

Mosqueiro Fm.
Carbonate Platform

Marituba Fm.
Coastal

Source: ANP/UFRN/FUNPEC, 2008
Structural Map

Sergipe Sub-basin Gravimetric Map Bouguer Residual Anomaly (mGal)

Legend
- Structures
- Production Fields
- Blocks on offer – R12

Source: ANP/UFRN/FUNPEC, 2008
Structural Map

Alagoas Sub-basin Gravimetric Map
Bouguer Residual Anomaly (mGal)

Legend
- Structures
- Production Fields
- Blocks on offer - R12

Source: ANP/UFRN/FUNPEC, 2008
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Late Aptian
Muribeca Fm. (Sergipe)
TOC 2%

Middle Aptian
Maceio Fm.
TOC 2%, up to 5%, high generator potential

Aptian to Neocomian
Barra de Itiuba and Coqueiro Seco Formations
TOC of 3%, high generator potential and Kerogen Types I and II

Early Permian
Aracare Fm.
TOC 2% up to 5%
Source Rocks

Maturation Map of Barra de Itiuba Source Rock (Neocomian)

%Ro
- Immature (0.2 – 0.55)
- Early oil (0.55 – 0.7)
- Main oil windows (0.7 – 1.00)
- Late oil (1.00 – 1.35)
- Humid gas (1.35 – 2.00)
- Dry and supermature gas (>2.00)

Source: ANP/UFRN/FUNPEC, 2008
Maturation Map of Coqueiro Seco Source Rock (Early Aptian)

%Ro
- Immature (0.2 – 0.55)
- Early oil (0.55 – 0.7)
- Main oil windows (0.7 – 1.00)
- Late oil (1.00 – 1.35)
- Humid gas (1.35 – 2.00)
- Dry and supermature gas (>2.00)

Source: ANP/UFRN/FUNPEC, 2008
Reservoirs

Sergipe Sub-basin

- **Albian to Aptian**
  Sintectonic Conglomerates

- **Aptian to Barremian**
  Maceio, Penedo and Coqueiro Seco Fm. Sinrift Sandstones $\Phi = 10\%$ to $25\%$

- **Early Aptian**
  Morro do Chaves Coquina

- **Neocomian**
  Rift Turbidites

- **Neocomian to Jurassic**
  Pre-Rift Sandstone and Serraria Fm.

- **Early Permian**
  Aracare Fm.

Alagoas Sub-basin

Source: ANP/UFRN/FUNPEC, 2008
Shales of Calumbi Fm.

Shales of Barra do Itiuba and Coqueiro Seco Formations

Shales of Feliz Deserto Formation and base of Barra do Itiuba Formation

Source: ANP/UFRN/FUNPEC, 2008
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<table>
<thead>
<tr>
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<th>Expected Plays</th>
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<tbody>
<tr>
<td>Aptian</td>
<td>Sintectonic Conglomerates</td>
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<td>Rift Turbidites</td>
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<td>Serraria Sandstones</td>
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<td>Pre-Rift Sandstones</td>
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<tr>
<td>Basement</td>
<td>Fractured Basement</td>
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</tbody>
</table>
Accumulation Models

Source Rock: Barra de Itiuba – Coqueiro Seco

Source: ANP/UFRN/FUNPEC, 2008
Accumulation Models

Source Rock: Muribeca

Legend:
- HC accumulation
- Source rock and direction of HC migration
- Pos-rift (purple) and sinrift fault
- SEQ-DRe
- SEQ-DTr
- SEQ-R5 (Maceio and Muribeca Fm.)
- SEQ-Ri
- SEQ-Pré-Ri
- SDRs
- Continental basement

Source: ANP/UFRN/FUNPEC, 2008
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Blocks on Offer
Alagoas Sub-basin

- Sectors SEAL-T2 and SEAL-T3
- 50 Blocks
- Total Area of 1,490 km²

Legend:
- Capital
- Production/Development Fields
- Sectors Round 12
- Blocks on Offer - Round 12
- Sedimentary basins
- Basement
Blocks on Offer
Sergipe Sub-basin

- Sectors SEAL-T4 and SEAL-T5
- 30 Blocks
- Total Area of 953 km²

Legend:
- Capital
- Production/Development Fields
- Sectors Round 12
- Blocks on Offer - Round 12
- Sedimentary basins
- Basement
Leads

Legend:
- **Capitals**
- **Leads Muribeca Fm./Carmópolis Mb. - Aptian**
- **Leads Barra do Itiuba Fm. - Barremian**
- **Leads Serraria Fm. - Berriasian**
- **Leads Fractured Basement**
- **Blocks on Offer - Round12**
- **Sedimentary Basin**
- **Basement**
Seismic Line 027-1464

São Miguel dos Campos Field

Leads

Serraria Fm. (Berriasian)

Faults

Basement
Leads

Seismic 027-0505

- SSEAL-T3
- Faults
- Serraria Fm. (Berriasian)
- Basement

Leads

262 251

240 240 228 216 217 208
Leads

Seismic Line 027-1171

- Embasamento
- Serraria Fm. (Berriasian)
- Barra de Itiuba Fm. (Barremian)

Faults
- Riachuelo Fm. (Albian)
- Carmopolis Mb. (Aptian)
- Barra de Itiuba Fm. (Barremian)
- Serraria Fm. (Berriasian)
- Basement
Leads

Seismic Line 027-0853

- Embasamento Serraria Fm. (Berriasian)
- Barra de Itiuba Fm. (Barremian)
- Riachuelo Fm. (Albian)
- Carmopolis Mb. (Aptian)
- Basement

SSEAL-T5
- 6,061 km of 2D Seismic Surveys
- 70 Wells
- Petroleum System Study of Sergipe-Alagoas Basin-ANP/UFRN 2008
- Gravimetry
## Contractual Aspects

<table>
<thead>
<tr>
<th>Name of the Sector</th>
<th>SECTORS SSEAL-T2 to SSEAL-T5</th>
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</thead>
<tbody>
<tr>
<td>Exploration Model</td>
<td>Mature</td>
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<tr>
<td>Number of Blocks</td>
<td>80</td>
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<td>Area on Offer</td>
<td>2,418.77 km²</td>
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<td>Exploration Phase</td>
<td>5 years</td>
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<td>Exploration Period</td>
<td>3+2 years</td>
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<td>Minimum Bonus</td>
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<td>Exploration Objective</td>
<td>Berraiasian (Serraria Fm.)</td>
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<tr>
<td>Stratigraphic Objective</td>
<td>Aptian (Muribeca Fm.)</td>
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Final Remarks

- Mature basin
- Active production of oil and gas in the northeast of Brazil
- Infrastructure for the oil industry
- 20% of the onshore reserves of the country
- Efficient petroleum system and diversity of plays
- Favorable conditions for oil and gas accumulations
- Adequate opportunities for small and medium-sized companies
National Agency of Petroleum, Natural Gas and Biofuels

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