The Growing Importance of the O&G Sector for the State of São Paulo

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Agenda

✓ Exploration and Production (E&P) Activities in Brazil
  ▪ Oil&Gas in State of São Paulo? Why just now?

✓ Main Characteristics of E&P Projects
  ▪ Barrels? What barrels? (Risks)

✓ Activities in the Santos Basin at São Paulo Offshore – Future Perspectives
  ▪ O&G Supply Alternatives

✓ Actions undertaken by the São Paulo Energy and Mining Secretariat
  ▪ Support to MME (“Gás para Crescer” Initiative, “Agenda Mínima”)
  ▪ State Energy Secretaries Forun
  ▪ São Paulo Target Plan for Natural Gas (2017-2029)

✓ Final Remarks
E&P Activities in Brazil
Oil in São Paulo? Why just now?

Source: ANP, 2011
E&P Activities in Brazil

November/2016:

- **42 Concessionaries**
- **26 Operators**

**Petrobras**

- Owner of 79% production
- Operator for 94% production

**Strategic Realignment**
Main Characteristics of E&P Projects

Risk Perception at Different Stages

<table>
<thead>
<tr>
<th>Phase</th>
<th>Capital</th>
<th>Risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>Exploration</td>
<td>Low</td>
<td>High</td>
</tr>
<tr>
<td>Appraisal</td>
<td>Medium</td>
<td>Medium</td>
</tr>
<tr>
<td>Development</td>
<td>High</td>
<td>Low</td>
</tr>
<tr>
<td>Production</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>
Main Characteristics of E&P Projects

Importance of Good-Quality Seismic Data (Risk Reduction)
Main Characteristics of E&P Projects

Oil Prices Risk

Brent Oil Prices (US$/barrel)
Main Characteristics of E&P Projects

US Production Boom

US Shale Oil and Shale Gas Producing Areas

U.S. tight oil production
million barrels of oil per day

Eagle Ford (TX)
Bakken (MT & ND)
Spraberry (TX & NM Permian)
Bonespring (TX & NM Permian)
Wolfcamp (TX & NM Permian)
Yeso-Glorieta (TX & NM Permian)
Niobrara-Codell (CO, WY)
Haynesville (LA & TX)
Marcellus (PA & WV)
Woodford (OK)
Granite Wash (OK & TX)
Austin Chalk (LA & TX)
Monterey (CA)


U.S. dry shale gas production
billion cubic feet per day

Marcellus (PA & WV)
Eagle Ford (TX)
Haynesville (LA & TX)
Barnett (TX)
Fayetteville (AR)
Woodford (OK)
Bakken (ND)
Antrim (MI, IN, & OH)
Rest of US 'shale'


Source: Sieminsky, EIA, 2014
E&P Activities in State of São Paulo

São Paulo State O&G Production (thousand boe/day)
Future Perspectives – Support to MME action

Sectors of 14th Bid Round

Deep and Ultra Deep Waters

Areas to be Unitized

O&G Exploratory Regimes
- Areas Under Concession
- Transfer of Rights (2010)
- Sharing Production (Libra field, 2013)
- 14th Bidding Round – 2nd half 2017
- 2nd Sharing Production (unitizable areas) – 2nd half 2017

BM-S-8 (Carcará)

Areas to be Unitized

Sapinhoá

Carcará

Santos Basin

Pre-Salt Polygon

Rio de Janeiro
Bolivia: Capacity: 30 MMm³/d
Future: 15 MMm³/d Petrobras

GNL Capacity: 41 MMm³/d
Idleness: 38 MMm³/d (November/2016)

Imported Gas

Future Perspectives
Future Perspectives

O&G Royalties and Special Takes received by the State and São Paulo Municipalities*

* Value includes the part of Special Fund relative to non producer cities
Future Perspectives

Forecasting State O&G Royalties by 2020

Forecast of O&G Government Takes by São Paulo State, according current Legislation (billion R$)

<table>
<thead>
<tr>
<th>Year</th>
<th>Production Fields - Petrobras' BP 17-21</th>
<th>Production Fields already Bid</th>
</tr>
</thead>
<tbody>
<tr>
<td>2016</td>
<td>0.81</td>
<td></td>
</tr>
<tr>
<td>2017</td>
<td>1.21</td>
<td></td>
</tr>
<tr>
<td>2018</td>
<td>1.63</td>
<td>2.03</td>
</tr>
<tr>
<td>2019</td>
<td>1.99</td>
<td>3.12</td>
</tr>
<tr>
<td>2020</td>
<td>2.13</td>
<td>3.67</td>
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</tbody>
</table>
State Actions

São Paulo Target Plan for Natural Gas

Potential Investments

Distribution - Conventional Market (non thermoelectric)
State Actions

Potential Investments

Thermoelectric Generation

- **Project UTE Lins**
  - City: Lins
  - Power: 1,5 GW
  - NG Consumption: 6.5 MMm³/d

- **UTE Fernando Gasparian**
  - Company: Petrobras
  - City: São Paulo
  - Capacity: 386 MW
  - Max Consumption: 1.9 MMm³/d

- **UTE Piratininga**
  - Company: Petrobras
  - City: São Paulo
  - Capacity: 190 MW
  - Max Consumption: 0.95 MMm³/d

- **UTE Euzébio Rocha**
  - Company: Petrobras
  - City: Cubatão
  - Capacity: 219 MW
  - Max Consumption: 1.3 MMm³/d

- **Project UTE Pedreira***
  - Company: EMAE – AES Tietê
  - City: São Paulo
  - Power: 750 MW
  - NG Consumption: 3 MMm³/d

- **Project UTE Pedreira***
  - Company: EMAE-GASEN/Siemens
  - City: São Paulo
  - Power: 750 MW
  - Consumption: 3 MMm³/d
State Actions - Renewables

*Hybrid Plants*

**Sugar cane Cultivation**
Harvest 2014/2015

- Brasil **9 million** hectares
- SP **4,7 million** hectares (52% of total)

- **140 plants**
- **51** generate energy
- **7,1 million m³/day** natural gas
- **Biometane**
## Forecast Natural Gas Consumption by Segment

### Pipelines Network Availability
Infrastructure ready for consumption

<table>
<thead>
<tr>
<th>Volume por Segmento (Mm³/d)</th>
<th>2016</th>
<th>2022</th>
<th>2027</th>
<th>2029</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residencial</td>
<td>668,88</td>
<td>1.057,26</td>
<td>1.297,11</td>
<td>1.393,15</td>
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<tr>
<td>Comercial</td>
<td>386,69</td>
<td>533,77</td>
<td>668,16</td>
<td>722,04</td>
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<tr>
<td>Industrial</td>
<td>10.901,43</td>
<td>10.989,43</td>
<td>11.991,72</td>
<td>12.395,31</td>
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<tr>
<td>GNC</td>
<td>25,30</td>
<td>40,16</td>
<td>42,61</td>
<td>43,66</td>
</tr>
<tr>
<td>GNV</td>
<td>581,06</td>
<td>1.020,91</td>
<td>1.214,14</td>
<td>1.291,66</td>
</tr>
<tr>
<td>Frotas Pesadas (Substituição Diesel Usinas)</td>
<td>-</td>
<td>361,24</td>
<td>434,68</td>
<td>463,10</td>
</tr>
<tr>
<td>Usina Híbrida (Cogeração)</td>
<td>-</td>
<td>107,75</td>
<td>385,88</td>
<td>497,10</td>
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<tr>
<td>Cogeração</td>
<td>727,87</td>
<td>1.294,79</td>
<td>1.384,95</td>
<td>1.421,02</td>
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<tr>
<td>Substituição</td>
<td>-</td>
<td>?</td>
<td>?</td>
<td>?</td>
</tr>
<tr>
<td><strong>Subtotal - Mercado Convencional</strong></td>
<td>13.291,21</td>
<td>15.405,31</td>
<td>17.419,24</td>
<td>18.227,04</td>
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<tr>
<td>Termogeração Existente</td>
<td>435,49</td>
<td>1.800,00</td>
<td>2.600,00</td>
<td>2.600,00</td>
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<tr>
<td>Termogeração Futura</td>
<td>-</td>
<td>5.000,00</td>
<td>9.400,00</td>
<td>10.600,00</td>
</tr>
<tr>
<td><strong>Subtotal - Mercado Termelétrico</strong></td>
<td>435,49</td>
<td>6.800,00</td>
<td>12.000,00</td>
<td>13.200,00</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>13.726,70</td>
<td>22.205,31</td>
<td>29.419,24</td>
<td>31.427,04</td>
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</tbody>
</table>
Final Remarks

- Natural Gas Virtuous Cycle Perspectives for the State of São Paulo
- Investment Rebound
- Establishment of State Long-Term Energy Policies
- Sustainable Development
Thank you!

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