EagleFord & Burgos Basin Cross Border Development Summit
Developing Realistic Exploration Cost Models To Support Large Scale Exploration in Frontier Markets

STEVEN ILKAY
MANAGING DIRECTOR
STEVEN@ANGLECAP.COM
416.728.2176
Angle Capital

- Non-Operated Focus
- WI and Minerals
- Invest with Top Operators
- Diversify through Different Plays, Operators
- Try not to be “Ahead of the Curve”
- Avoid Science Projects, Hype

- Focus Areas include Williston Basin, Ardmore/Arkoma Basins, South/East Texas, Permian, Appalachian, DJ and Uinta Basins
- EagleFord, Mississippian, Woodford, Wolf Plays, Niobrara, Bakken
- Select Canadian Plays
Introduction

• Challenges in building exploration cost models in frontier markets
• EagleFord Costs and EUR updates
• EagleFord Cost Improvements Over Time
• Likely Major Cost Drivers in Burgos Basin Wells
• Finding Comparables where they exist
• Lessons Learned from Vaca Muerta, Canadian Tight Plays

Steven Ilkay, Angle Capital, 416.728.2176 , Steven@AngleCap.com
MX Reserve Estimates

<table>
<thead>
<tr>
<th>#</th>
<th>Province</th>
<th>Oil (Bbls)</th>
<th>Wet gas (TCF)</th>
<th>Dry gas (TCF)</th>
<th>Billion (BOE)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Tampico-Misantla</td>
<td>30.7</td>
<td>20.7</td>
<td>0</td>
<td>34.8</td>
</tr>
<tr>
<td>2</td>
<td>Burgos MZ</td>
<td>0</td>
<td>9.5</td>
<td>44.3</td>
<td>10.8</td>
</tr>
<tr>
<td>3</td>
<td>Burro-Picachos</td>
<td>0.6</td>
<td>6.6</td>
<td>11.4</td>
<td>4.2</td>
</tr>
<tr>
<td>4</td>
<td>Sabinas</td>
<td>0</td>
<td>0</td>
<td>49</td>
<td>9.8</td>
</tr>
<tr>
<td>5</td>
<td>Veracruz</td>
<td>0.6</td>
<td>0</td>
<td>0</td>
<td>0.6</td>
</tr>
<tr>
<td>6</td>
<td>Chihuahua</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>TOTAL</td>
<td>31.9</td>
<td>36.8</td>
<td>104.7</td>
<td>60.2</td>
</tr>
</tbody>
</table>
MX Gas Imports -> Gassy Shales in Play

**Mexico's Natural Gas Demand Soars**
Imports from the United States expected to rise through 2017

- Non-logistical pipeline imports from U.S.
- Logistical pipeline imports from U.S.
- LNG Import

Source: U.S. Energy Information Administration
wallstreetdaily.com
## MX Shale Activity

<table>
<thead>
<tr>
<th>Area/Basin</th>
<th>2010</th>
<th>2011</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
<th>2016</th>
<th>Unit / Play</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burro Picachos</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>20 wells</td>
<td>Eagle Ford, La Casita</td>
</tr>
<tr>
<td>Sabinas</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>30 wells</td>
<td>Eagle Ford, La Casita</td>
</tr>
<tr>
<td>Burgos Mesozoico</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>25 wells</td>
<td>Eagle Ford, Pimienta</td>
</tr>
<tr>
<td>Tampico-Misantla</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>80 wells</td>
<td>Agua Nueva, Pimienta</td>
</tr>
<tr>
<td>Veracruz</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10 wells</td>
<td>Maltrata</td>
</tr>
<tr>
<td>Chihuahua</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>10 wells</td>
<td></td>
<td>Eagle Ford, Paleozoico</td>
</tr>
</tbody>
</table>

**Total of: 175 wells**

**Evaluation period by area or play: 2 - 4 years**
**Major MX Basin Analysis**

### SHALE GAS RESERVOIR PROPERTIES AND RESOURCES OF MEXICO

<table>
<thead>
<tr>
<th>Basic data</th>
<th>Basin/gross area</th>
<th>Tampico basin, 16,000 sq miles</th>
<th>Turpan platform, 2,810 sq miles</th>
<th>Veracruz basin, 9,030 sq miles</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geologic age</td>
<td>Jurassic</td>
<td>Jurassic</td>
<td>L-M Cretaceous</td>
<td>Upper Cretaceous</td>
</tr>
<tr>
<td>Prospective area, sq miles</td>
<td>14,240</td>
<td>1,950</td>
<td>1,550</td>
<td>8,150</td>
</tr>
<tr>
<td>Thickness, ft</td>
<td>16,650</td>
<td>50,500</td>
<td>400-1,000</td>
<td>600</td>
</tr>
<tr>
<td>Net</td>
<td>245</td>
<td>225</td>
<td>245</td>
<td>120</td>
</tr>
<tr>
<td>Depth, ft</td>
<td>6,300-10,700</td>
<td>6,000-10,100</td>
<td>6,600-10,700</td>
<td>9,250-12,000</td>
</tr>
<tr>
<td>Average</td>
<td>6,200</td>
<td>7,900</td>
<td>8,800</td>
<td>11,200</td>
</tr>
<tr>
<td>Reservoir pressure</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
<td>Normal</td>
</tr>
<tr>
<td>Average TOC, wt %</td>
<td>3.0</td>
<td>3.9</td>
<td>3.0</td>
<td>2.0</td>
</tr>
<tr>
<td>Thermal maturity, % R0</td>
<td>1.30</td>
<td>1.25</td>
<td>1.30</td>
<td>1.50</td>
</tr>
<tr>
<td>Clay content</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
<td>Low/Medium</td>
</tr>
<tr>
<td>Gas concentration, bcf/sq mile</td>
<td>63</td>
<td>65</td>
<td>72</td>
<td>29</td>
</tr>
<tr>
<td>Risked G IP, tcf</td>
<td>216</td>
<td>25</td>
<td>28</td>
<td>38</td>
</tr>
<tr>
<td>Risked recoverable, tcf</td>
<td>65</td>
<td>8</td>
<td>8</td>
<td>9</td>
</tr>
</tbody>
</table>

Challenges in Building Cost Models

• Little publicly available data (Production, Costing, Etc)
• Opaque cost structures of State Owned Oil Companies
• Very few onshore players
• Little relevant/related recent exploration history
• Difficulty in obtaining public data (infrastructure, pipelines, production and permitting data, etc)
• Few-to-nil public comparables
• Easy to be fooled by proximity
Cost Drivers

• Infrastructure (roads and rail)
• Terrain/Site Prep
• Security
• Water access, availability
• Electricity
• Customs, Tariffs & Taxes
• Royalty Schemes
• Regulatory Considerations (disposal, injection, cuttings, etc)
• Takeaway capacity
• Processing and Storage capacity
Key Questions

• What is the state of oilfield logistics?
• To what degree can private entrants control operations, key services and infrastructure?
• Can some vertical integration be accomplished?
• Will wells be stimulated with Ceramic Proppant, RCS or Sand?
• What is the supply of Frac Sand providers in the vicinity?
• Proximity to rail?
• Proppant logistics “last mile” considerations
• Limiting proppant trucking will be key in managing completions costs
• Establishing a quality framework for the transportation and delivery of proppant
Frontier Markets: Canadian Learnings

• Deep Northern Plays (Duvernay, Montney) extraordinarily expensive vs similar US tight plays
• Comparative cost drivers are higher unit labor costs, transportation, regional infrastructure, site costs (clearing, etc) and completions
• Takeaway capacity and midstream infrastructure have slowed development
• Majority of first $2B of industry exploration uneconomic
• Shallow, southern plays (Cardium, Viking) wells reached profitability and scale sooner
Frontier Markets: Canadian Learnings

- Lack of northern rail and road infrastructure led to skyrocketing Total Delivered Cost of Proppant (TDCP)
- Transportation & Logistics often comprise up to 90% of TDCP in far northern programs
- Although similar to EagleFord geology, completions costs in Duvernay remain 70-100% higher
- Rail capacity and infrastructure challenges remain large obstacle to controlling exploration program costs
- Although there are local sources of Frac Sand, most buyers prefer importing from as far away as 2,000 km away, leading to surging proppant costs
- The “last mile” is dominated by expensive trucking
- Industry development remains far below potential due to supply chain issues
- Favorable royalty scheme primary driver in development

Steven Ilkay, Angle Capital, 416.728.2176, Steven@AngleCap.com
Vaca Muerta Completion Costs

YPF

Completion: Costs Improvements

<table>
<thead>
<tr>
<th>Year</th>
<th>USD 0.20</th>
<th>USD 0.40</th>
<th>USD 0.60</th>
<th>USD 0.80</th>
<th>USD 1.00</th>
<th>USD 1.20</th>
<th>USD 1.40</th>
<th>USD 1.60</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2012</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2013</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2014 YTD</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Implemented Initiatives:
- Monthly “Bundle” contracts
- Multiple proppant providers
- Adoption of new technology
- Operational efficiency Optimization:
  3 stg/day, SIMOPS, Plug & Perf technology

Future Opportunities:
- Renegotiation of Bundle Contracts
- 100 % local proppant utilization
- Bulk proppant logistics
- Water distribution Network

Steven Ilkay, Angle Capital
416.728.2176, Steven@AngleCap.com
Vaca Muerta Drilling Time Improvements

Implemented Initiatives:
- MPD / UBD Operational Procedure
- Introduction of Casing Drilling
- Directional Drilling Optimization
- Multipad locations

Future Opportunities:
- Widespread use of Casing Drilling
- New automated rigs / skidding
- Use of 4” DP for entire well
- Mud Plant
Major Play IRR’s

Exhibit 11: Most fields achieve 11% IRRs in the $80-$90/bbl Brent range; this would fall by about $6/bbl for a 10% reduction in capital costs.

Brent oil price in $/bbl for 11% IRR

Source: Goldman Sachs Global Investment Research.

Steven Ilkay, Angle Capital
416.728.2176, Steven@AngleCap.com
Top Unconventional Plays

Current Production
Top 2 Plays = 62%
Top 5 Plays = 84%
Ongoing EagleFord Improvements

Eagle Ford Excellence

- Best-in-play results driven by acreage quality, drilling and completion performance

Average Eagle Ford Well – BOED

Spud to Rig Release – Days per 10,000 Feet

Production averages adjusted for first full month of production
Source: IHS Enerdeq

Steven Ilkay, Angle Capital
416.728.2176, Steven@AngleCap.com
Well Costs Impacts on ROR

Eagle Ford Well Estimated ROR as a Function of EUR and Well Cost

$90.00/Bbl NYMEX oil; $3.00/Mcf NYMEX natural gas

Well Cost, millions

- Western Acreage: $7.0
- Eastern Acreage: $8.0

Note: Individual well economics only. RGL price differential +$1.50/Bbl. Oil price differential +$7.00/MMBtu.
2012 EagleFord Well Costs

Fig. 1: Eagle Ford – 2012 Cost per Well

- Rosetta
- El Paso
- Marathon
- EE Estimated Average
- Pioneer/RIL
- SM Energy
- Anadarko

Source: Evaluate Energy
Drilling & Completions Cost Improvements

Operational Improvements (Normalized)

**Overview**
- Over the past two years, made significant progress and increased knowledge of how to drill, complete and produce Eagle Ford wells.
- Experience and operational improvements have led to significant reductions in drilling and completion costs.
- In 2013, began drilling from batch drilled pads using a drilling rig equipped with a "walking" package.
  - Realized cost savings of approx. $325,000 per well on initial wells drilled using this rig.
  - Expect the use of batch drilling and the "walking" rig will lead to total cost savings of approx. $400,000 per well or more going forward.

**Eagle Ford Drilling Costs / Drilled Foot**

<table>
<thead>
<tr>
<th>Year</th>
<th>West</th>
<th>Central</th>
<th>East</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2014</td>
<td>$242</td>
<td>$230</td>
<td>$210</td>
</tr>
<tr>
<td>2011</td>
<td>$271</td>
<td>$250</td>
<td>$266</td>
</tr>
<tr>
<td>2012</td>
<td>$271</td>
<td>$250</td>
<td>$266</td>
</tr>
<tr>
<td>2013</td>
<td>$271</td>
<td>$250</td>
<td>$266</td>
</tr>
<tr>
<td>2014-2016</td>
<td>$271</td>
<td>$250</td>
<td>$266</td>
</tr>
</tbody>
</table>

**Eagle Ford Completion Costs / Completed Foot**

<table>
<thead>
<tr>
<th>Year</th>
<th>West</th>
<th>Central</th>
<th>East</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-2014</td>
<td>$1,280</td>
<td>$1,250</td>
<td>$1,210</td>
</tr>
<tr>
<td>2011</td>
<td>$1,280</td>
<td>$1,250</td>
<td>$1,210</td>
</tr>
<tr>
<td>2012</td>
<td>$1,280</td>
<td>$1,250</td>
<td>$1,210</td>
</tr>
<tr>
<td>2013</td>
<td>$1,280</td>
<td>$1,250</td>
<td>$1,210</td>
</tr>
<tr>
<td>2014</td>
<td>$1,280</td>
<td>$1,250</td>
<td>$1,210</td>
</tr>
</tbody>
</table>

Note: "2014 YTD" - As of March 3, 2014. Year classification is based on opel data.

1. Drilled foot: the measured depth from surface to total depth. Excludes any drillstills drilled with a pilot hole. Any drillstills drilled outside the West Central and East and sidetrack wells drilled with three strings of casing.
2. Completed foot: the completed length of the lateral. Excludes any drillstills drilled with a pilot hole. Excludes any drillstills in the West and Central where premium repper was used.

Steven Ilkay, Angle Capital, 416.728.2176 ,
Steven@AngleCap.com
EagleFord Sand Usage Map
Drilling Stats

El Halcón YTD 2013 Drilling Stats

- Avg. Drilling Days: 18.88 (43% decrease), 15.69 (10.75)
- Avg. Feet / Day: 850, 1,152 (1,656)
- Drilled Lateral Length (Feet): 7,312, 7,973 (9,033)

Legend:
- First Five Wells
- Last Five Wells
- HK Best In Class
Cost Reduction Drivers

- Factory Drilling
- Lower Prod Hole MW
- Remove HWDP & Jars in Lateral
- 9 5/8" Surface Casing
- Surface Pump & Dump Mud
- BHA Optimization
- Surface Casing Depth
- 24 Hr Rig Move
- WBM vs. OBM
- Alternate Gas
- Wholesale Mud Products
- ERW vs. Seamless Surf Pipe

Future Cost Reduction
Conclusion

• Cost drivers in MX shale plays not publicly disclosed as yet
• Proppant and Oilfield Supply Chain cost structures likely to be substantially higher than Eagleford
• Well costs will be much higher than Eagleford, for similar lateral lengths
• Direct correlation between transportation infrastructure, proppant demand and well costs
• Royalty regime can have large impact on amount of investment in the Burgos Basin
Developing Realistic Exploration Cost Models

STEVEN ILKAY
ANGLE CAPITAL
STEVEN@ANGLECAP.COM
416.728.2176