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

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# 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

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# 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

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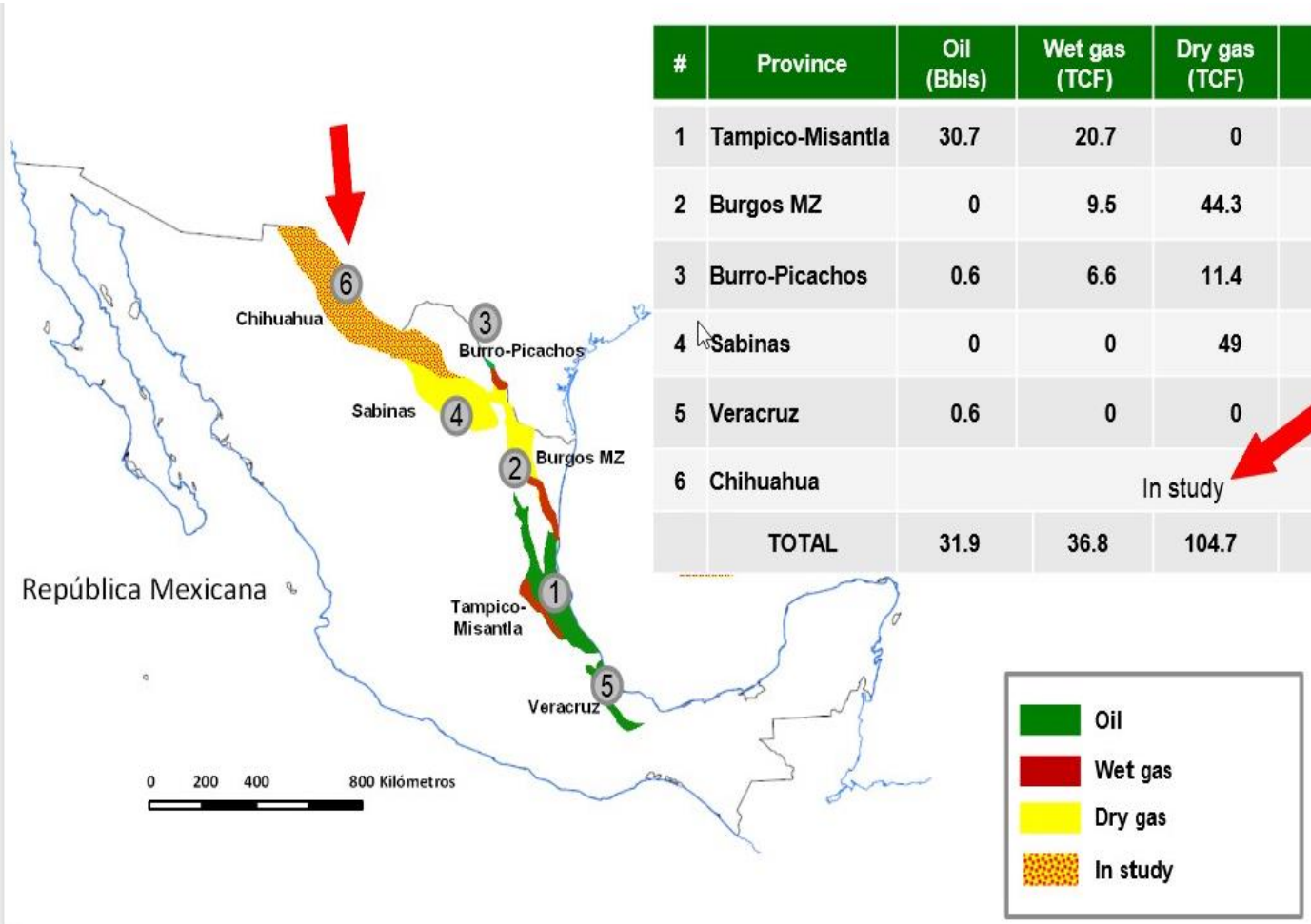
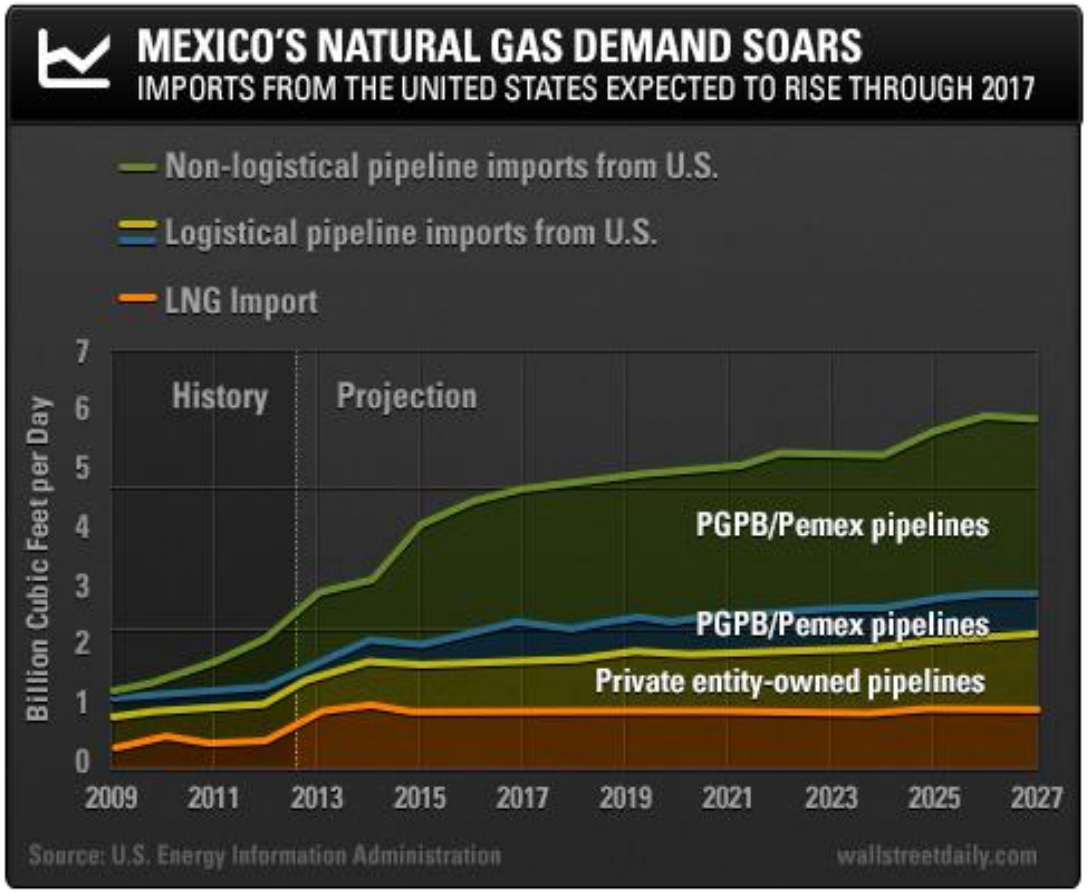
# MX Reserve Estimates

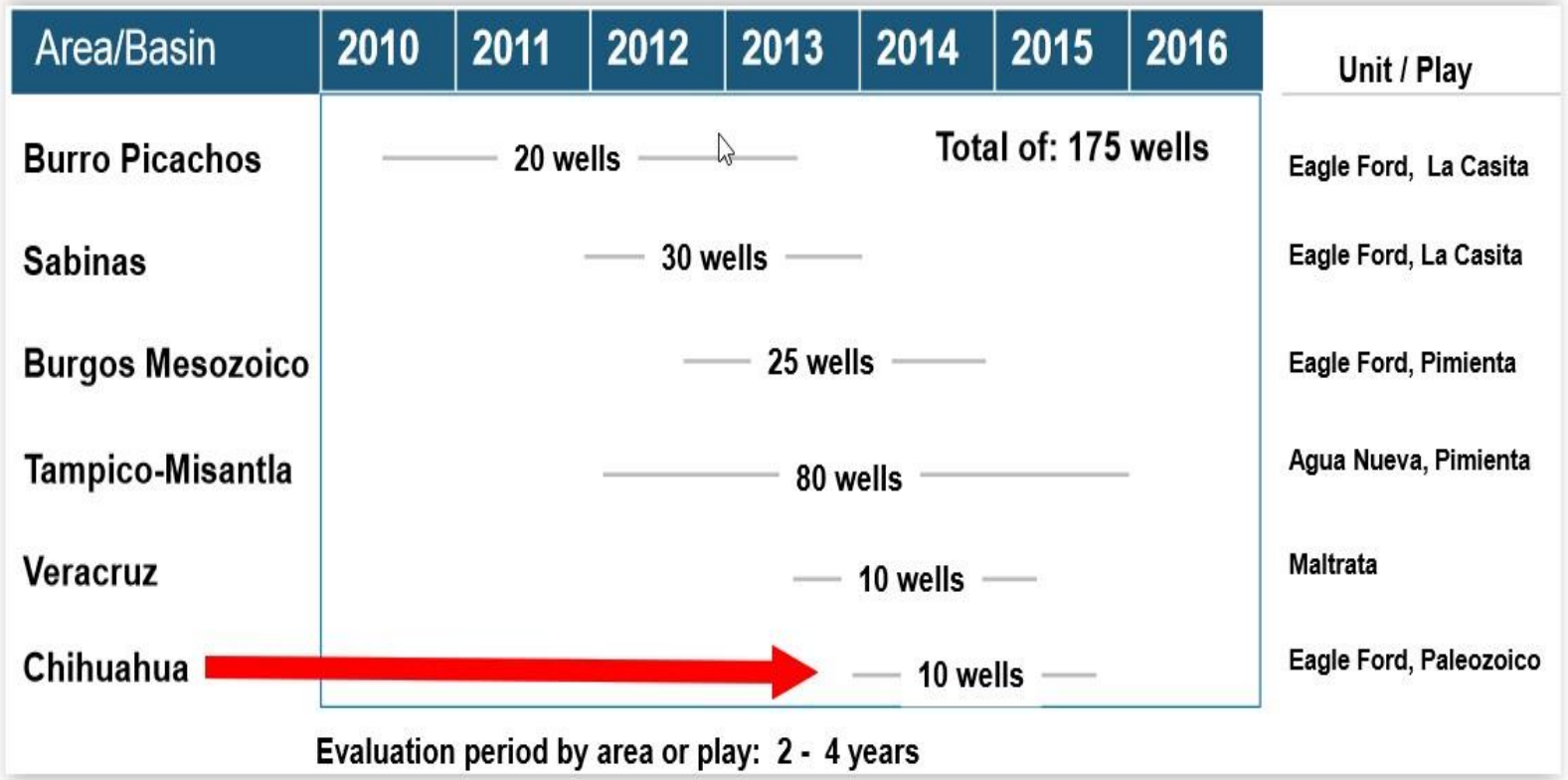



| # | Province | Oil (Bbls) | Wet gas (TCF) | Dry gas (TCF) | Billion (BOE) |
|---|---|---|---|---|---|
| 1 | Tampico-Misantla | 30.7 | 20.7 | 0 | 34.8 |
| 2 | Burgos MZ | 0 | 9.5 | 44.3 | 10.8 |
| 3 | Burro-Picachos | 0.6 | 6.6 | 11.4 | 4.2 |
| 4 | Sabinas | 0 | 0 | 49 | 9.8 |
| 5 | Veracruz | 0.6 | 0 | 0 | 0.6 |
| 6 | Chihuahua | In study | | | |
| | TOTAL | 31.9 | 36.8 | 104.7 | 60.2 |

# MX Gas Imports -> Gassy Shales in Play



# MX Shale Activity



# Major MX Basin Analysis

**SHALE GAS RESERVOIR PROPERTIES AND RESOURCES OF MEXICO**

| Basic data | Basin/gross area | | Burgos basin, 24,200 sq miles | | Sabinas basin, 23,900 sq miles | |
|---|---|---|---|---|---|---|
| | Shale formation | | Eagle Ford shale | Tithonian shales | Eagle Ford shale | Tithonian La Casita |
| | Geologic age | | L-M Cretaceous | Upper Jurassic | L-M Cretaceous | Late Jurassic |
| Physical extent | Prospective area, sq miles | | 18,100 | 14,520 | 12,000 | 12,000 |
| | Thickness, ft | Interval | 300-1,000 | 100-1,400 | 300-1,000 | 200-2,600 |
| | | Organically rich | 600 | 500 | 500 | 800 |
| | | Net | 400 | 200 | 400 | 240 |
| | Depth, ft | Interval | 3,390-16,400 | 5,000-16,400 | 5,000-12,500 | 9,800-13,100 |
| | | Average | 10,380 | 12,000 | 9,000 | 11,500 |
| Reservoir properties | Reservoir pressure | | Normal | Normal | Underpressured | Underpressured |
| | Average TOC, wt % | | 5.0 | 3.0 | 4.0 | 2.0 |
| | Thermal maturity, % Ro | | 1.30 | 1.30 | 1.30 | 2.50 |
| | Clay content | | Low | Low | Low | Low |
| Resource | GIP concentration, bcf/sq mile | | 209 | 75 | 113 | 58 |
| | Risked GIP, tcf | | 1,514 | 272 | 218 | 56 |
| | Risked Recoverable, tcf | | 454 | 82 | 44 | 11 |

| Basic data | Basin/gross area | | Tampico basin, 15,000 sq miles | Tuxpan platform, 2,810 sq miles | | Veracruz basin, 9,030 sq miles |
|---|---|---|---|---|---|---|
| | Shale formation | | Pimienta | Tamaulipas | Pimienta | Maltrata |
| | Geologic age | | Jurassic | Jurassic | L-M Cretaceous | Upper Cretaceous |
| Physical extent | Prospective area, sq miles | | 14,240 | 1,950 | 1,950 | 8,150 |
| | Thickness, ft | Interval | 16-650 | 50-500 | 400-1,000 | 0-600 |
| | | Organically rich | 490 | 300 | 490 | 300 |
| | | Net | 245 | 225 | 245 | 120 |
| | Depth, ft | Interval | 3,300-10,700 | 6,000-10,100 | 6,600-10,700 | 9,850-12,000 |
| | | Average | 6,200 | 7,900 | 8,500 | 11,200 |
| Reservoir properties | Reservoir pressure | | Normal | Normal | Normal | Normal |
| | Average TOC, wt % | | 3.0 | 3.0 | 3.0 | 2.0 |
| | Thermal maturity, % Ro | | 1.30 | 1.25 | 1.30 | 1.50 |
| | Clay content | | Low | Low | Low | Low/medium |
| Resource | GIP concentration, bcf/sq miles | | 63 | 65 | 72 | 29 |
| | Risked GIP, tcf | | 215 | 25 | 28 | 38 |
| | Risked recoverable, tcf | | 65 | 8 | 8 | 9 |

Source: "World Shale Gas Resources: An Initial Assessment of 14 Regions," EIA April 2011. Using data from Advanced Resources International.

# 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

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# 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

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# Frontier Markets: Canadian Learnings

- Deep Northern Plays (Duvernay, Montney) extroadinarily 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

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# 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

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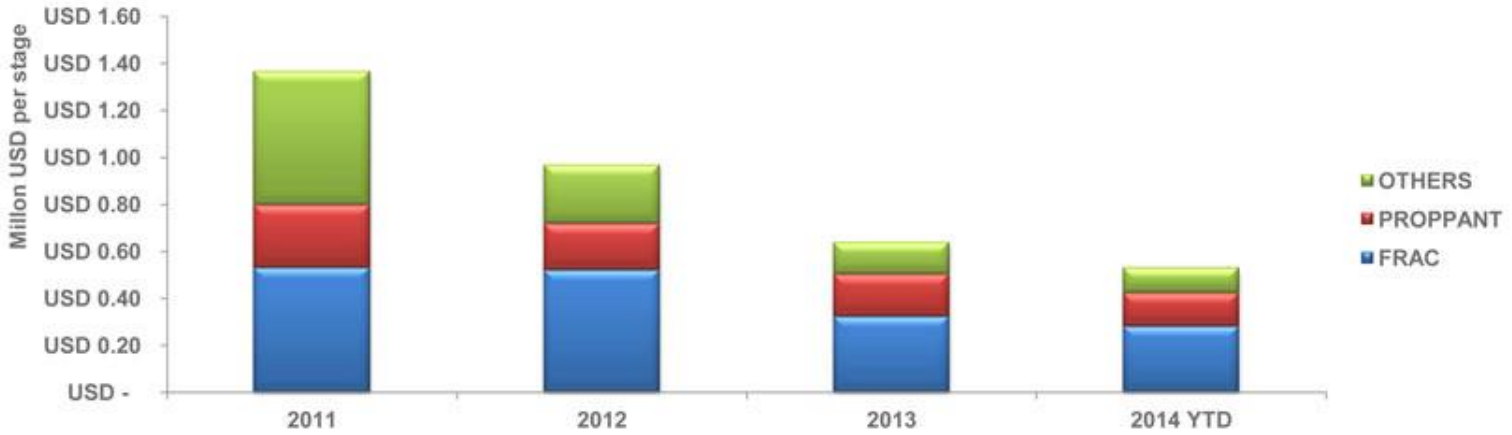
# Vaca Muerta Completion Costs

YPF | **Completion:** Costs Improvements




**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



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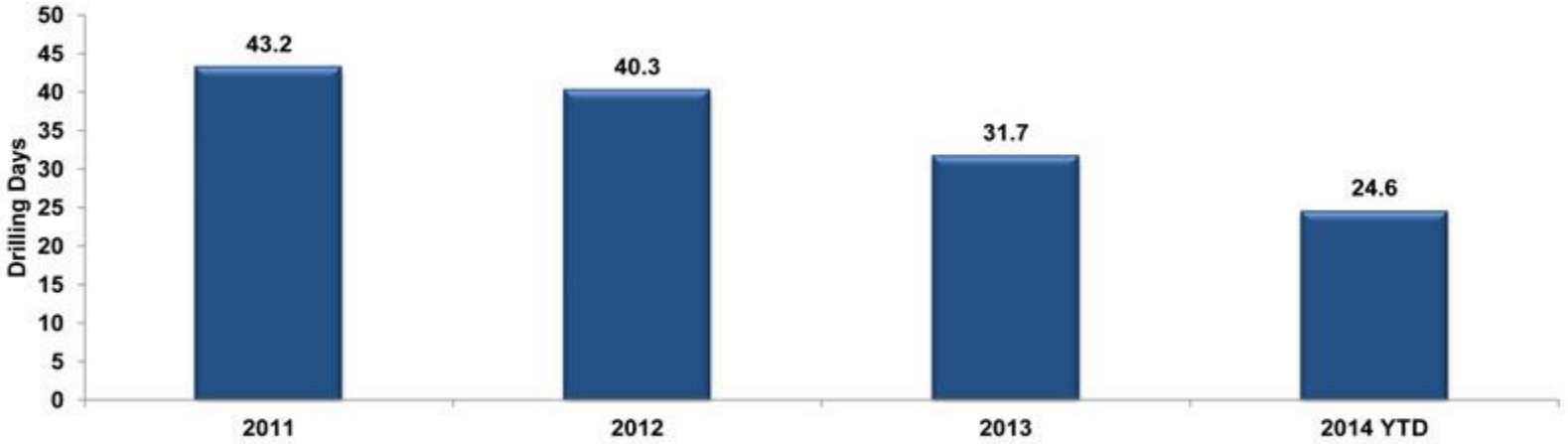
# Vaca Muerta Drilling Time Improvements

YPF | **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



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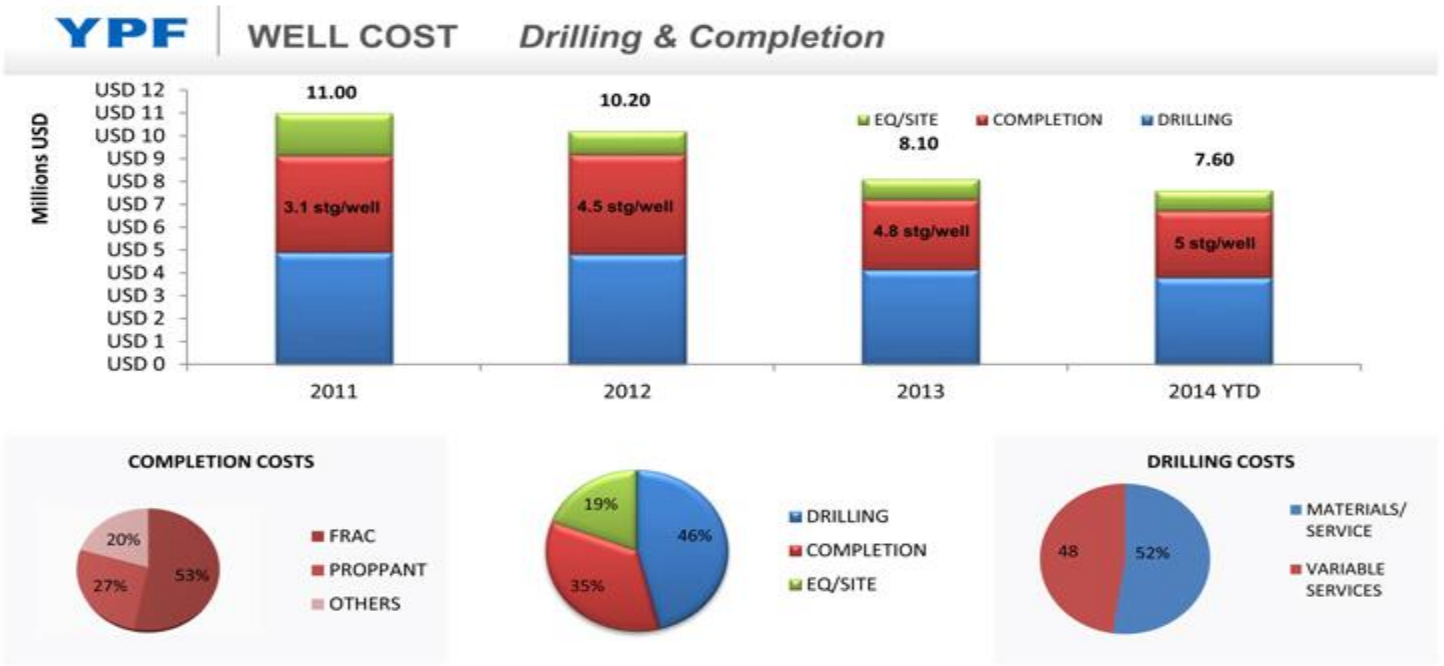
# Vaca Muerta Drilling & Completion Costs

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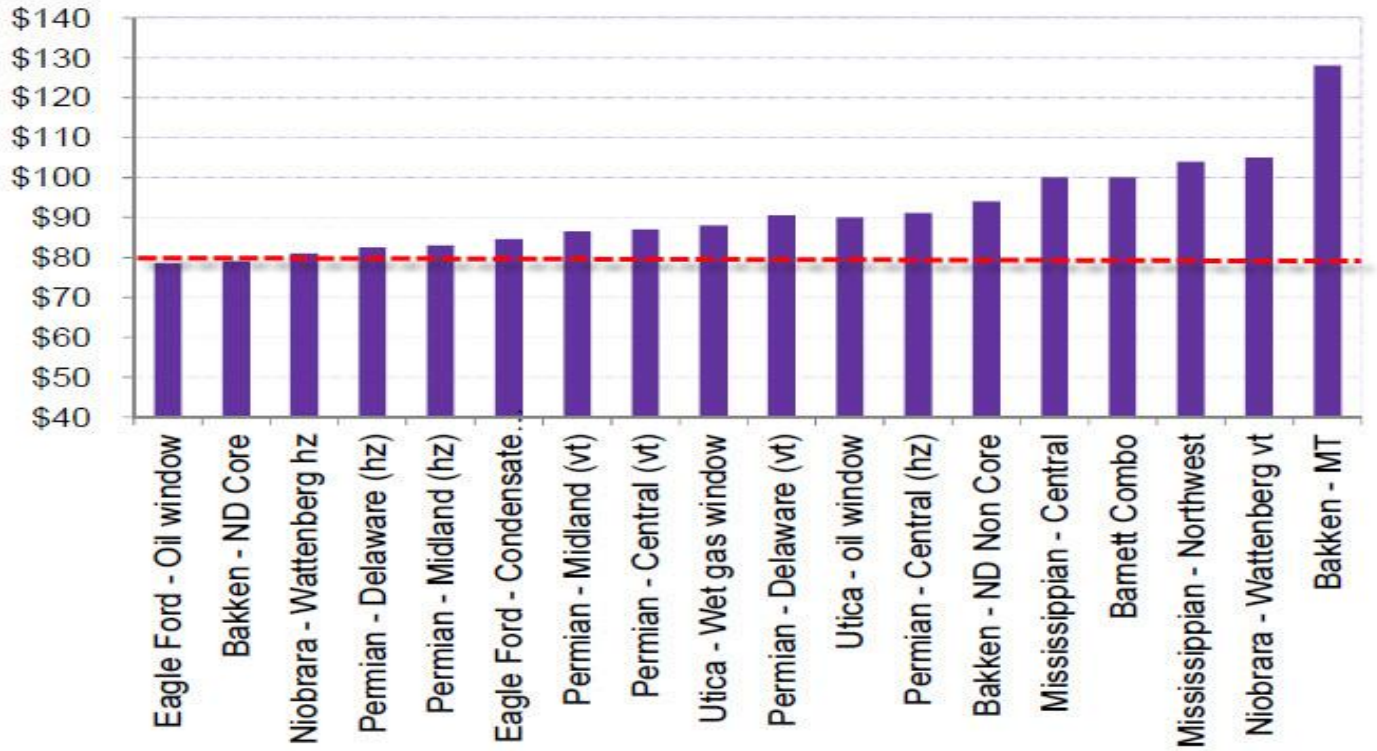
# Major Play IRR's

**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.*

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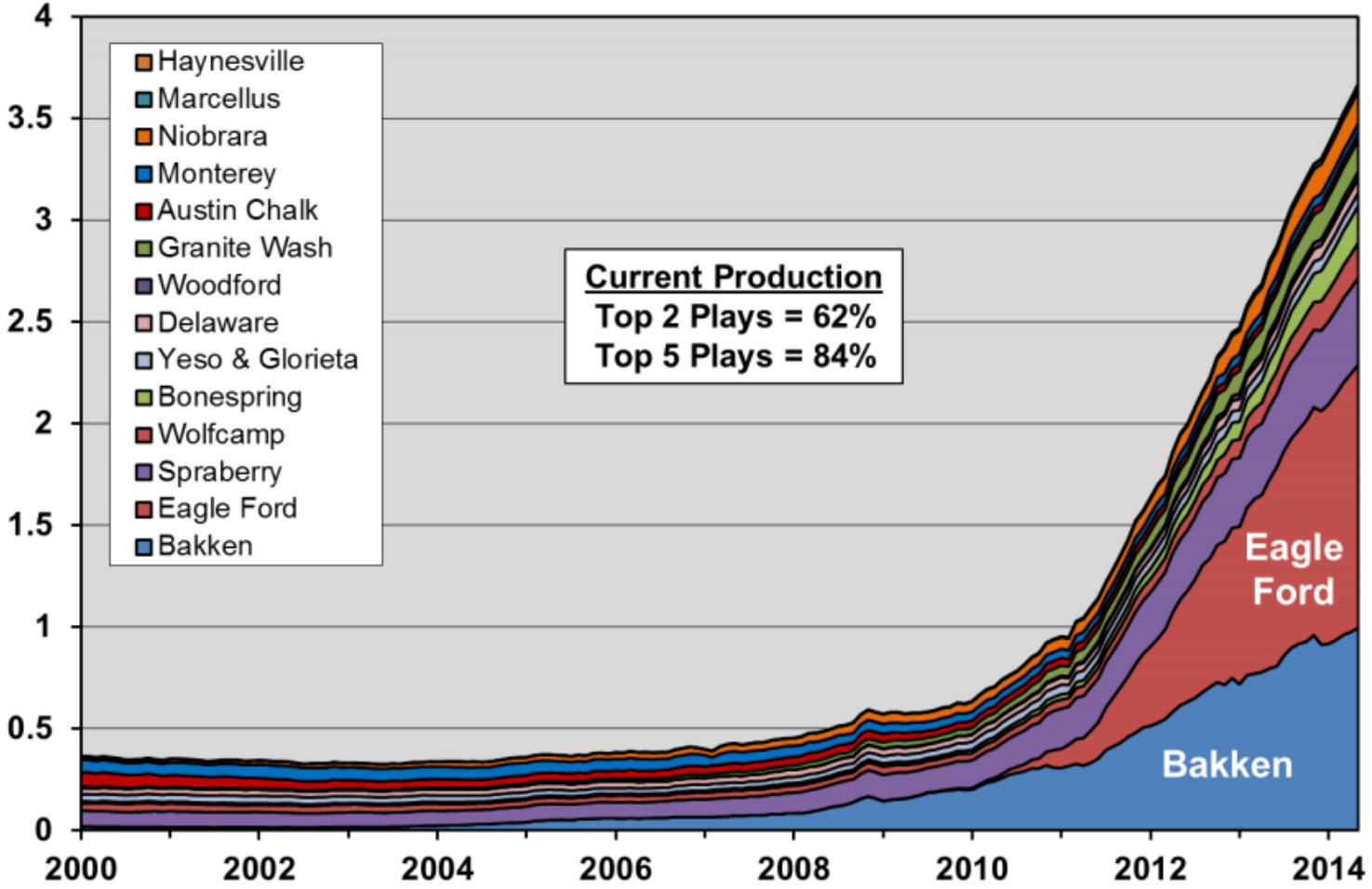
# Top Unconventional Plays

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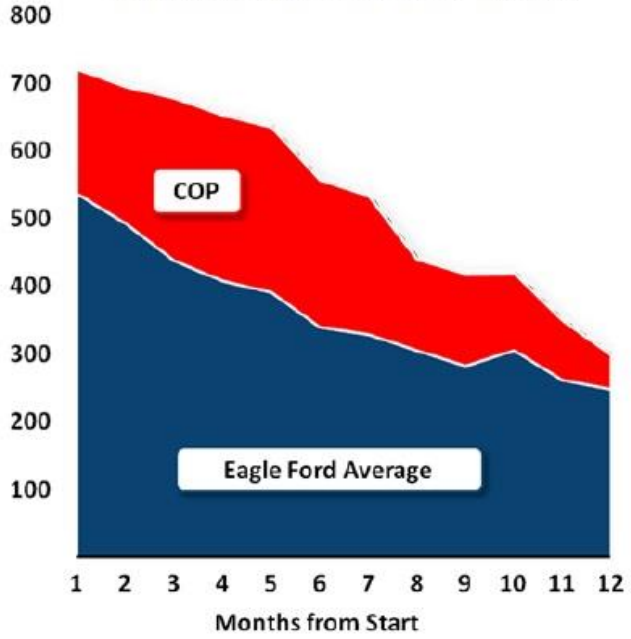
# Ongoing EagleFord Improvements

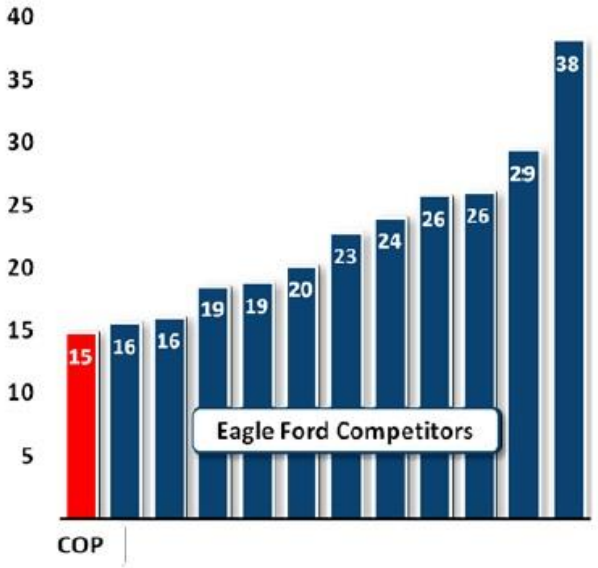
## Eagle Ford Excellence

- 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



ConocoPhillips

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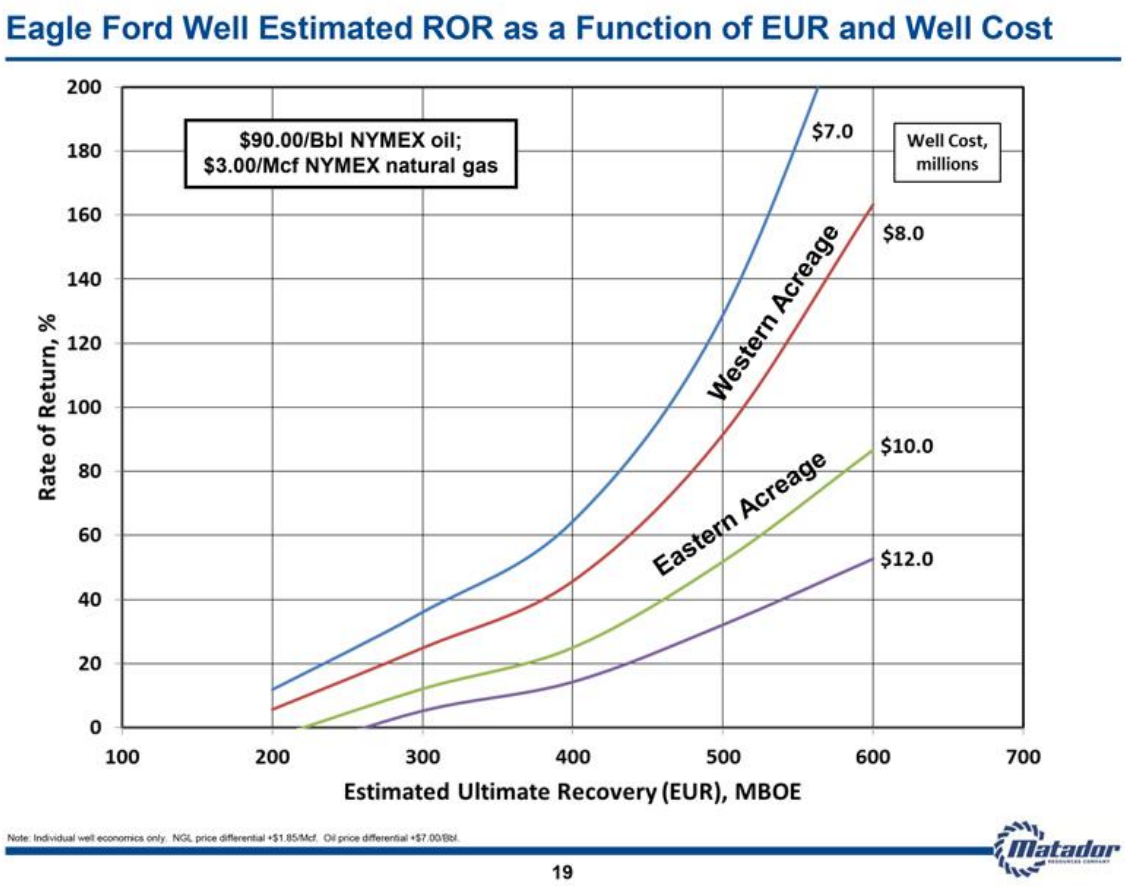
# Well Costs Impacts on ROR

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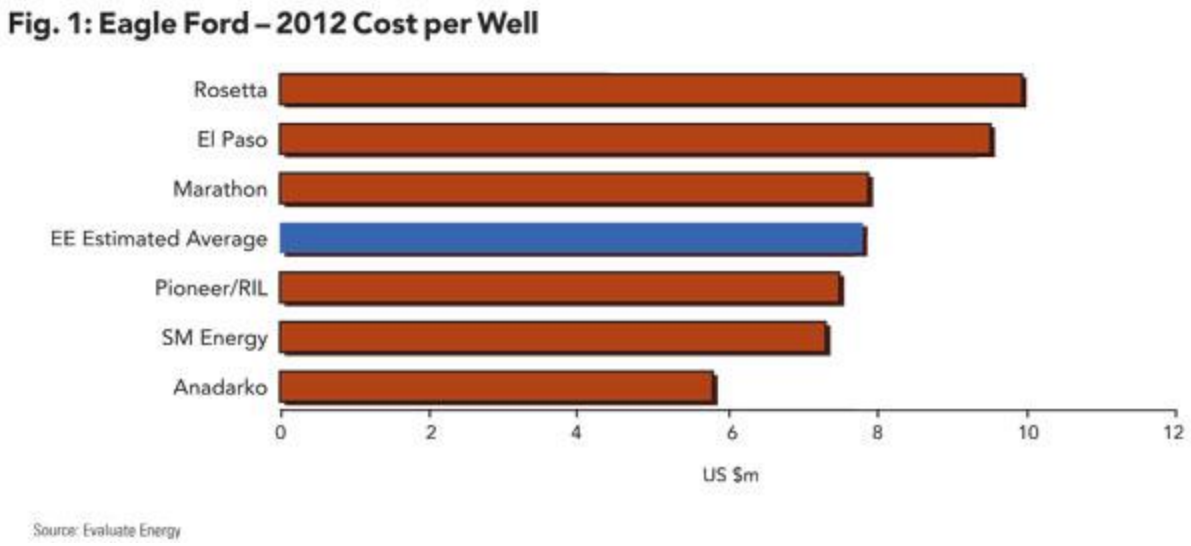
# 2012 EagleFord Well Costs



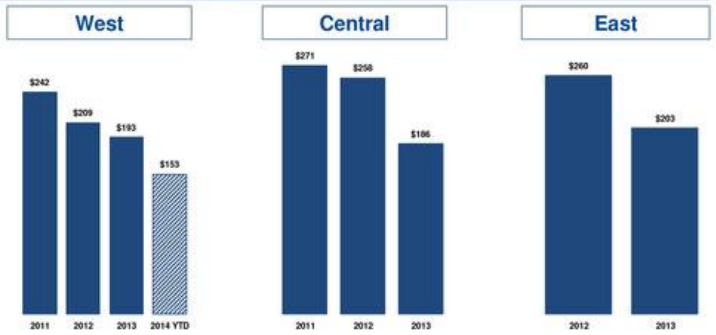
# Drilling & Completions Cost Improvements

## Operational Improvements (Normalized)

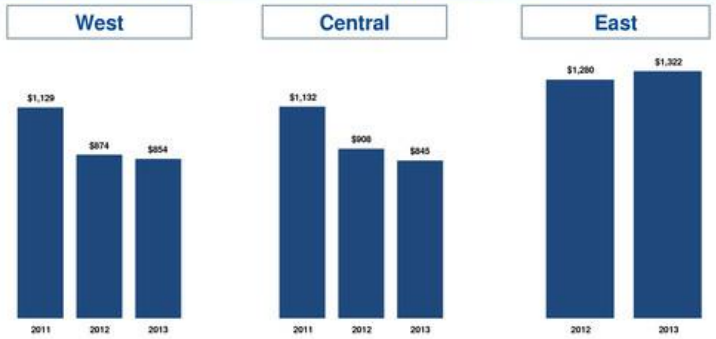
### Overview

- 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(1)




### Eagle Ford Completion Costs / Completed Foot(2)




Note: "2014 YTD" – As of March 1, 2014. Year classification is based on spud date.
(1) Drilled foot is the measured depth from surface to total depth. Excludes any/all wells drilled with a pilot hole, any/all wells drilled outside the West, Central and East and any/all wells drilled with three strings of casing.
(2) Completed foot is the completed length of the lateral. Excludes any/all wells drilled with a pilot hole. Excludes any/all wells in the West and Central where premium proppant was used.

Matador

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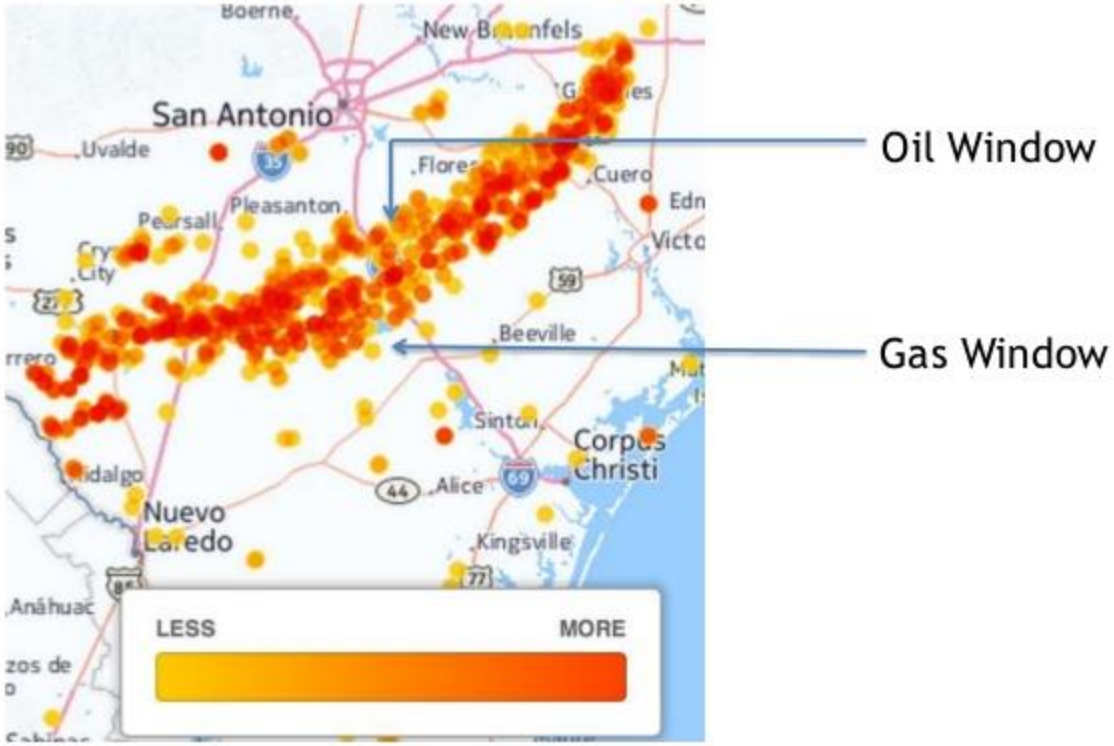
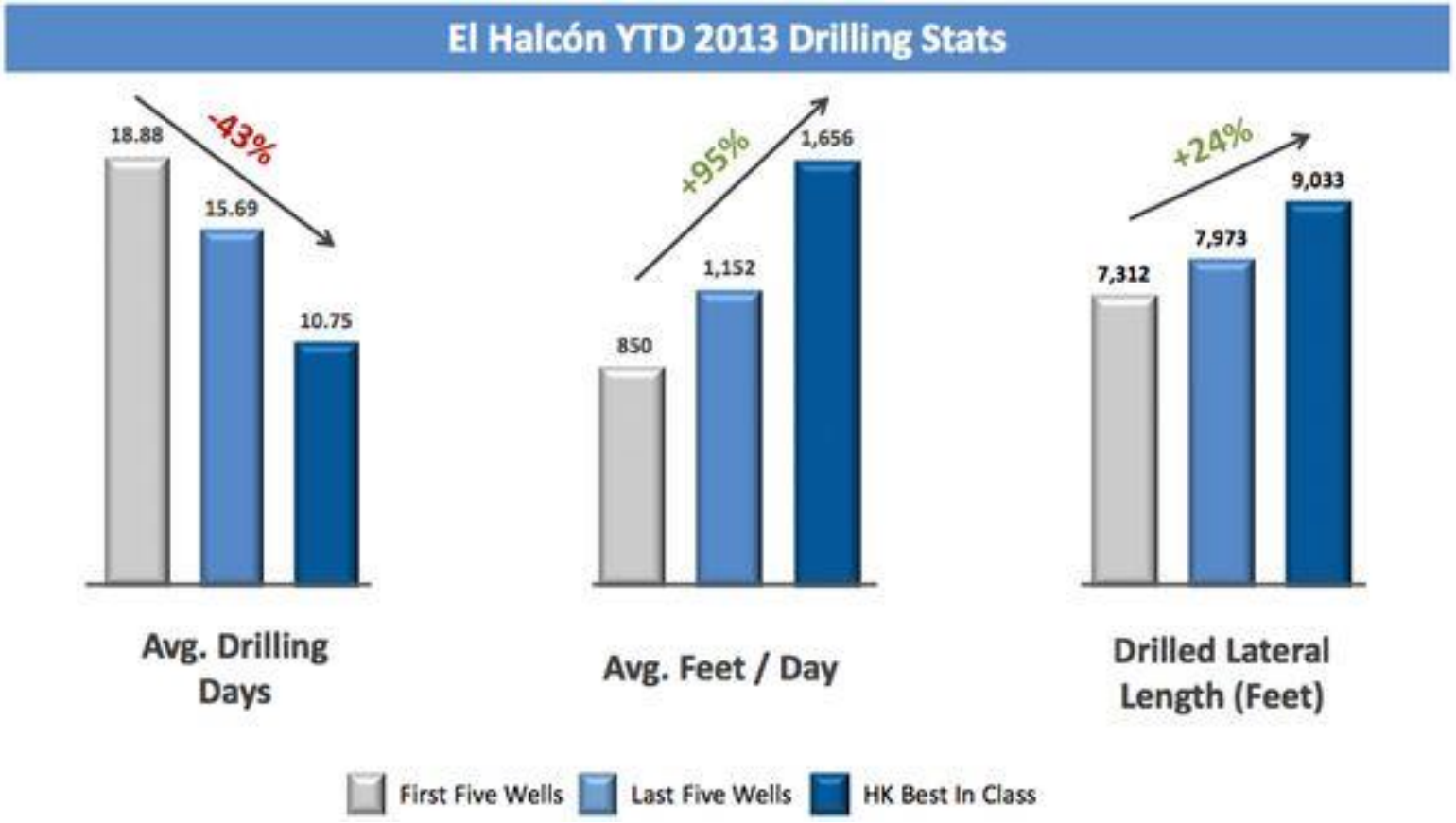
# EagleFord Sand Usage Map

## EAGLE FORD SAND USAGE

Energent Group

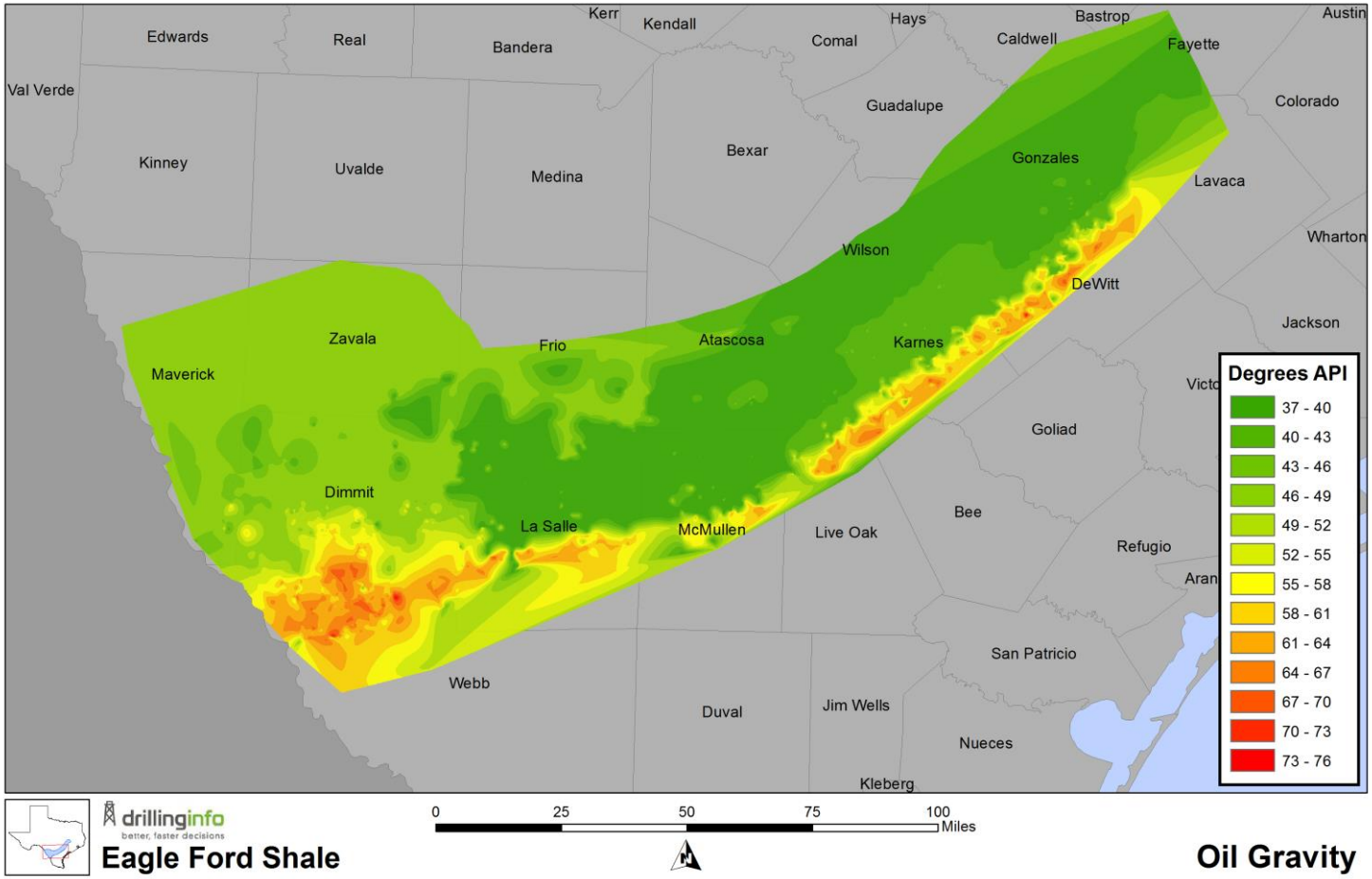


# Drilling Stats



# Cost Reduction Drivers

# EagleFord Oil Gravity Map

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# 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

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# Developing Realistic Exploration Cost Models

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