Petroleum Equipment Supplier Assn. Credit Interchange Division Annual Meeting

> October 22-25, 2013 Austin, Texas



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Hydraulic Fracture Technology:

Just How Will This Affect My Credit Decisions?

Trends & Traps?

One "Expert" Definition

Hydraulic fracturing is a technique used by operators to recover natural gas from shale formations.

Source: Legal Article entitled Frac Water: An Update on Supplies and Safety; February 2011

True, but

Another, but better

TERMINOLOGY: SHALE OIL AND TIGHT OIL:

Although the terms shale oil, and tight oil are often used interchangeably in public discourse, shale formations are only a subset of all low permeability tight formations, which include sandstones and carbonates, as well as shales, as sources of tight oil production. Within the United States, the oil and natural gas industry typically refers to tight oil production rather than shale oil production, because it is a more encompassing and accurate term with respect to the geologic formations producing oil at any particular well. EIA has adopted this convention.

Source: Technically Recoverable Shale Oil and Shale Gas Resources; EIA; June 10, 2013



Source: Energy Information Administration based on data from various published studies. Updated: May 9, 2011

Unconventional Gas is Now Almost Half of U.S. Production

Oil and Natural Gas







Hydraulic Fracturing





Abundant Gas Resources - Fundamentally Altering U.S. Gas Supply



 Since 2000, the U.S. has gone from 8 years of supply to in excess of 100 years⁽³⁾ – with virtually all of the increase coming from the commercialization of shale gas

(1) Source: ELA. Current based on 2008 data (2) Source: Jefferies & Company estimates

(3) 23.3 Tcf annual consumption in 2000 and current estimated consumption of 23.2 Tcf based on 2008 annual consumption. Data per EIA.

Jefferies

Groundwater Protection through Proper Well Construction

The EPA, in a review of incidents of drinking water well contamination, found "no confirmed cases linked to fracturing fluid injection of CBM (coalbed methane) wells or subsequent underground movement of fracturing fluid."

Source: API

Groundwater Protection through Proper Well Construction

Response by API to the EPA Pavillion Groundwater & Monitoring Report

http://api.org/policy-and-issues/policy-items/hf/api-reviews-of-usgsreports-on-epa-pavillion-groundwater-monitoring

Source: American Petroleum Institute

Video Demonstration of Horizontal Drilling Project, with Frac Stimulation

3D Frac Animation: http://www.youtube.com/watch?v=fFUxq9UoIN4 Source: Trial Exhibits

Video Tour of Frac Operation: http://www.youtube.com/watch?v=Eu8VqiiJq1M&feature=youtu.be Source: API

Ten Points to Know about Shale Gas

http://www.api.org/~/media/Files/Policy /Hydraulic_Fracturing/Hydraulic-Fracturing-10-points.pdf

More Water Issues

- Is there enough water supply for household and business use, and for frac'ing wells?
- Use of Groundwater Conservation District (GCD)
 efforts to restrict supplies
- Frac Tank Traps for the Unwary
- Is Frac'ing Safe? To Fresh Water Zones? To people and animals?

What is the Acreage Exposure Held by Your Customer Base?

Source:

Review of Emerging Resources: U.S. Shale Gas and Shale Oil Plays. U.S. Energy Information Administration; July 2011

Source, see: http://ftp.eia.doe.gov/natgas/usshaleplays.pdf



Eagle Ford Shale Overview

- Upper Cretaceous Age (Turonian/ Cenomanian) deposit extending from southwest to northeast Texas
 - Found at depths of 8,000-14,000'
 - Thickness of up to 400' and average of 250-300'
 - Austin Chalk 400' to 550' of gross pay
 - Up to 900' of potential Eagle Ford & Austin Chalk pay
 - Pressure gradients 0.5 to 0.8 psi/ft
 - Fairway has been extended from Hawkville Area in La Salle County southwest to Rio Grande River in Northwest Webb County
 - Depositional basin created upper and lower sections of Eagle Ford and provided porous Austin Chalk section with 400 to 500' thickness
 - Austin Chalk overlies the Eagle Ford and is also prospective for horizontal drilling; the play has been prolific throughout Gulf Coast
 - Well and completion designs have trended toward 5,000'+ laterals with 12+ fracture stimulation stages





Marcellus Lease Holders

Anadarko Petroleum	275,000
Atlas Energy Resources LLC	483,000
Cabot Oil & Gas	332,919
Carrizo Oil & Gas	57,000
Chesapeake	1,200,00
CNX Gas	161,000
Dominion	800,000
Equitable Resources	400,000
EXCO Resources	393,000
Penn-Virginia	15,000
Petroleum Development	35,000
Range Resources	1,400,00
Rex Energy	57,000
Quest Energy Partners L.P.	119,000
Southwestern Energy	100,000
Talisman	640,000
Ultra Petroleum	140,100
Unit Corp.	38,000
XTO Energy	<u>152,000</u>
Total	6,798,019 acres

Eagle Ford Dry Gas Zone Lease Holders

EOG Resources49,000Swift Energy78,000

Eagle Ford Condensate Zone Lease Holders

Total	569,500 acres
Talisman	<u>37,000</u>
Rosetta Resources	29,500
Pioneer Natural Resources	89,000
Petrohawk Energy	270,000
Murphy Oil Corporation	100,000
EOG Resources	26,000
Comstock	18,000

Eagle Ford Oil Zone Lease Holders

1,429,000	acres
442,000	
87,000	
100,000	
35,000	
505,000	6
260,000	F
	260,000 505,000 35,000 100,000 87,000 <u>442,000</u> 1,429,000

EOG now reports 639,000 acres for 2013

BHP Billiton reports 332,000 acres

> Others: Chesapeake Energy: 435,000 Ac ConocoPhillips: 227,000 Ac Marathon: 300,000 Ac

In 2010, these companies have leased 2,125,500 net acres (3.321 sq.miles) in Eagle Ford Trend

Eagle Ford / Austin Chalk Well Costs (AFE)

- Below AFE assumes 4,000' lateral, TVD of 11,000' and 12 stage frac
 - > AFE for 5,000' lateral, TVD of 11,000' and 15 stage frac would be \$7.2 MM

Intangible Well Costs	
Location & Roads	\$200,000
Drilling Rig (\$25,500 Day Rate)	800,000
Directional Drilling	275,000
Rig Mobilization	150,000
Drilling / Completion Fluids	230,000
Cementing Accessories	135,000
Equipment Rental - Surface	130,000
Fuel / Lubricants	125,000
Completion Rig / Coil Tubing / Snubbing Unit	120,000
Stimulation/Frac - 12 Stage Frac	2,800,000
Supervision	110,000
Other Costs	500,000
Total	\$5,575,000
Tangible Well Costs	
Production Casing / Liner	450,000
Misc Equipment - Production	250,000
Other Costs	175,000
Total	\$875,000
Grand Total	\$6,450,000

Historical Animation

Texas: Eagle Ford

http://www.eia.gov/todayinenergy/detail.cfm?id=3770 Source: U.S. Energy Information Administration

Pennsylvania: Marcellus

http://www.eia.gov/todayinenergy/detail.cfm?id=6390

North Dakota: Bakken

http://www.eia.gov/todayinenergy/detail.cfm?id=3750

Texas Eagle Ford Shale Oil Production 2008 through July 2013



Source: Railroad Commission of Texas Production Data Query System (PDQ)

09/20/2013



One Operator's Perspective

EOG Resources, Inc.

Source: 2013 Financial Reporting Services and Investor Relations

U.S. Horizontal Crude Oil Growth 2005-2013* Only Two Major Drivers



Top Oil Producers* in Top Horizontal Plays



* Source IHS: Crude and condensate production from horizontal wells.

** Bakken includes Bakken, Three Forks and Sanish formations in ND, MT

*** Permian includes Wolfcamp and Bone Spring formations

EOG Resources South Texas Eagle Ford Oil

Estimated Potential Reserves*

Window

Wet Gas

Dry Gas

Total

Crude Oil

Oil	MMBo	1,500
NGLs	MMBbl	375
Gas	Bcf	<u>1.950</u>
Total MMBoe, Net to EOG		2,200

Cargest Oil Producer in the Eagle Ford
 ≈ 173 MBoepd, Net at June 30, 2013

 Continued Outstanding Well Results – 2Q 2013
 Large Number of Wells Drilled on Western Acreage Contributing to Growth and Returns

Net Acres

569,000

21,000

49.000

639,000



San Antonio

Current Production Mix

NGLs

10%

Gas

12%

* Estimated potential reserves, not proved reserves. Includes 552 MMBoe proved reserves booked at December 31, 2012.

EOG Resources South Texas Eagle Ford Operations Update

Second Round of Reserve Increase – February 2013

● 1.6 BnBoe to 2.2 BnBoe Potential*, Net to EOG

- Estimated 8% Recovery of Estimated 26.4 BnBoe in Place, Net to EOG
- >4,900 Drilling Locations Yet to Complete
 -40-Acre Spacing in East
 -65-Acre Spacing in West
- Estimated 400 MBoe Reserves Per Well, NAR

2013 Operations

• Western Acreage Activity Contributing to Growth and Returns Current Well

Economics >100% Direct ATROR**

O Plan to Drill ≈ 440 Net Wells, 25 Rigs Currently

Ocontinue to Decrease Number of Drilling Days, Currently <12</p>

• Using EOG Sand Continues to Decrease Well Costs and Increase Efficiencies

\$5.5 MM CWC Target for 5,500' Average Lateral Length Well

* Estimated potential reserves, not proved reserves. Includes 552 MMBoe proved reserves booked at December 31, 2012.

** See reconciliation schedule.

EOG Resources Maximizing NPV of the Eagle Ford



* Net after royalty.

** See reconciliation schedule.

EOG Resources Bakken/Three Forks Oil

Results Continue to Improve Across Acreage

Increased Drilling Inventory to 12 Years from 7 Years

Core Area

- ≈ 90,000 Net Acres in Bakken Core Area
- Recent Drilling Results Delivering 100% Direct ATROR*
- O Develop with 160-Acre Spacing, Strong IP Rates
 - Parshall 25-3032H
 - 2,685 Bopd
 - Van Hook 29-1113H 2,390 Bopd
 - Liberty 106-0107H
- 1,955 Bopd

Antelope Extension

Bakken – Bear Den 20-1708H – 2,455 Bopd

Operations

- New Frac Technology Improves Recovery and Returns
- Plan to Complete 53 Net Wells in 2013 Core and Antelope Areas -Increase Activity in 2014 Innovative Crude-by-Rail System
- -Currently Securing LLS Pricing at St. James Shifting to Use EOG Self-Sourced Sand and Reduce Well Cost







EOG Resources Ft. Worth Barnett Shale Combo

11%

NGLs

43%

of Well

Combo

- EOG is the Largest Oil Producer in the Barnett Combo ≈ 205,000 Net Acres in Core Area Revenues ≈ 89% Liquids Weighted, 46% Oil - 1st Year Revenues are 68% Oil ≈ 3-Rig Program in 2013 – Plan to Drill 145 Net Wells Recent Strong Well IP Rates NGLs Bpd Mcfd Bopd 335 to 435 25 to 35 170 to 245 Madsen (3 Wells) Typical Well ≈ 380 Mboe, Gross for \$2.7 MM **CV00**st Advantages Due to Self-Sourcing of Natur Frac Materials Gas
 - ≈ 35% Direct ATROR* Even With Current **Ethane Prices**



Note: 166 MMBoe proved reserves in Combo booked at December 31,

2012.

ELLS

EOG-Owned Processing Plant Improves NGL Economics

^{*} See reconciliation schedule.

Another Operator Perspective

BHP Billiton

Source: BHP Billiton Petroleum Onshore US Shale Briefing; Nov 14, 2011

Hawkville has the thickest pay in the Eagle Ford

Equivalent EUR (Bcfe)



- 224,000 net acres with average operated working interest of 85%
- Contributes >50% of BHP Billiton's net Eagle Ford production at 180 MMcfed or 30 Mboe/d (36% liquids)
- Total risked net resource potential 10.7 Tcfe (34% liquids)
- Liquids pipeline available end FY12 (via third party)
- Ramping up from 5 to 13 rigs by 2013

Individual well economics (rich gas)	
Initial production	5 MMcfd gas 613 bbl/d condensate
EUR	2.5 Bcf gas 250 Mbbl NGL 195 Mbbl condensate
D&C cost	US\$8.8 million
Rate of return	43%

Based on November 2011 NYMEX prices.

Individual well economics (lean gas)		
Initial production	8.5 MMcfd gas	
EUR	5.0 Bcf gas 207 Mbbl NGL	
D&C cost	US\$9.6 million	
Rate of return	15%	

Based on November 2011 NYMEX prices.

Black Hawk in economic sweet spot of the play

Equivalent EUR (Bcfe)





- Black Hawk produces the highest value product mix in our shale portfolio
- High liquid content substantially improves individual well economics
- Liquids pipeline available end FY12 (via third party)
- 58,300 net acres at 48% average operated working interest
- Current net production of 22 Mboe/d (77% liquids)
- Total risked net resource potential 2.8 Tcfe (72% liquids)
- Ramping up from 9 to 13 rigs by 2013

Individual well economics		
Initial production	3.8 MMcfd gas; 1,615 bbl/d condensate	
EUR	1.8 Bcf gas; 220 Mbbl NGL; 550 Mbbl condensate	
D&C cost	US\$9.9 million	
Rate of return	>100%	

Based on November 2011 NYMEX prices.

Haynesville is the highest producing gas field in the US

Haynesville shale EUR contour map



Individual well economics		
Initial production	8.5 MMcfd gas	
EUR	8 Bcf gas	
D&C cost	US\$10 million	
Rate of return	17%	

- BHP Billiton has the largest amount of the best acreage in the highest producing gas field in the US
 - Strong acreage position with 345,000 net acres in the Haynesville and Lower Bossier
 - Core of the field yields EURs well above field average
 - Natural fractures, high TOC¹ and over pressured
 - Average operated working interest 75% in Haynesville, and 70% in Lower Bossier
- Petrohawk has been an industry leader in technical achievements in this field
- Direct access to an extensive gas pipeline network with ample capacity to support production growth
- Average reservoir depth of 11,800 feet with an average D&C cost of US\$10 million per well (down from US\$15 million per well with technology improvements)
- Current net production 780 MMcfd
- Total risked net resource potential of 22 Tcf at 90 acre well spacing

Supply vs Demand?

1. Global Natural Gas Consumption http://www.eia.gov/todayinenergy/detail.cfm?id=5810

2. World Petroleum Use sets record high in 2012 http://www.eia.gov/todayinenergy/detail.cfm?id=12691

3. World Consumption of Coal http://www.eia.gov/todayinenergy/detail.cfm?id=4390

Rig Count Trend: Oil Price



Well-Type Trend: Gas Price



New Requirements for Frac Fluid Disclosures

- Public profile concerns
- Regulatory responses
- Frac Focus as a depository for chemical makeup
- Expectation is that this disclosure trend will continue

FRACTURING INGREDIENTS			
Product Category	Main Ingredient	Purpose	Other Common Uses
Water	99.5%	Expand fracture and deliver sand	Landscaping and manufacturing
Sand		Allows the fractures to remain open so the gas can escape	Drinking water filtration, play sand, concrete and brick mortar
OTHER	Approximately 0	.5%	
Diluted Acid	Hydrochloric acid or muriatic acid	Helps dissolve minerals and initiate cracks in the rock	Swimming pool chemical and cleaner
Antibacterial agent	Glutaraldehyde	Eliminates bacteria in the water that produces corrosive by-products	Disinfectant; Sterilizer for medical and dental equipment
Breaker	Ammonium persulfate	Allows a delayed break down of the gel	Used in hair coloring, as a disinfectant, and in the manufacture of common household plastics
Corrosion inhibitor	n,n-dimethyl formamide	Prevents the corrosion of the pipe	Used in pharmaceuticals, acrylic fibers and plastics
Crosslinker	Borate salts	Maintains fluid viscosity as temperature increases	Used in laundry detergents, hand soaps and cosmetics
Friction reducer	Polyacrylamide	Will during the particular friction	Water treatment, soil conditioner
	Mineral Oils	Slicks the water to minimize miction	Used in cosmetics including hair, make-up remover, nail and skin products
Gel	Guar gum or hydroxyethyl cellulose	Thickens the water in order to suspend the sand	Thickener used in cosmetics, baked goods, ice cream, toothpaste, sauces and salad dressings
Iron control	Citric acid	Prevents precipitation of metal oxides	Food additive; food and beverages; lemon juice ~7% citric acid
Clay stabilizer	Potassium chloride	Creates a brine carrier fluid	Used in low-sodium table salt substitute, medicines and IV fluids
pH adjusting agent	Sodium or potassium carbonate	Maintains the effectiveness of other components, such as crosslinkers	Used in laundry detergents, soap, water softener and dishwasher detergents
Scale inhibitor	Ethylene glycol	Prevents scale deposits in the pipe	Used in household cleansers, de-icer, paints and caulk
Surfactant	Isopropanol	Used to increase the viscosity of the fracture fluid	Used in glass cleaner, multi-surface cleansers, antiperspirant, deodorants and hair color

Other Disclosures

- <u>http://fracfocus.org</u>
- <u>http://www.rangeresources.com/getdoc/50e3bc</u> 03-3bf6-4517-a29b-e2b8ef0afe4f/Well-Completion-Reports.aspx

Texas Legislative Response

- Texas House Bill 3328
- Texas is first state to require natural gas operators to publicly disclose the chemicals used in hydraulic fracturing
- See <u>http://fracfocus.org</u>
- See Text of bill: <u>http://www.capitol.state.tx.us/tlodocs/82R/billtex</u> <u>t/pdf/HB03328F.pdf#navpanes=0</u>
- The Act takes effect on 9-1-2011

Texas H.B. No. 3328

- Chapter 91, Natural Resources Code
- Sec.A91.851 DISCLOSURE OF COMPOSITION OF HYDRAULIC FRACTURING FLUIDS
- (1) require an operator of a well on which a hydraulic fracturing treatment is performed to:

(A) complete the form posted on the hydraulic fracturing chemical registry Internet website of the Ground Water Protection Council and the Interstate Oil and Gas Compact Commission with regard to the well

(B) include in the form:

- (i) the total volume of water used
- (ii) each chemical ingredient
- (iii) post the form on the website specified
- (iv) submit the form to the commission
- (v) provide a list of all other chemicals not otherwise listed

Sec.A91.851 DISCLOSURE OF COMPOSITION OF HYDRAULIC FRACTURING FLUIDS

- (2) require a service company that performs the frac treatment to provide the operator with the information necessary to comply
- (3) prescribes a process to allow the withholding of certain information as a trade secret
- (4) requires a person who desires to challenge a claim of trade secret with a deadline of 2 years after filing of the well completion report
- (5) limits the persons who may challenge to
 - (1) landowner of the property the well is located
 - (2) adjacent landowners
 - (3) a department or agency of the State
- (4) requires notification to service company of a trade secret challenge

Sec.A91.851 DISCLOSURE OF COMPOSITION OF HYDRAULIC FRACTURING FLUIDS

Section 2

This Act applies only to a hydraulic frac treatment performed on a well for which an initial drilling permit is issues on or after the date the initial rules adopted by the RRC under that subchapter takes effect.

Section 3

The RRC shall adopt rules pursuant to the Act no later than July 1, 2012.

Section 4

This Act takes effect September 1, 2011.

Louisiana Response

- La. Admin. Code 33 IX 905(b)
- Mandatory reporting to LA Dept of Natl Resources, or to FracFocus
- Requires reporting on well-by-well basis

Issue: The Newly Designated Operator

- All invoices go solely to the new operator
- But, New Operator has no assets, no value
 - Option #1: Deal with it
 - Option #2: Require a Corporate Guarantee
 - Option #3: Request a Personal Guarantee (unlikely)

Issue: The New Bankruptcy Model

- Corporate Entity files for Bankruptcy
- Suspicion of fraud, deceit, etc.
- What to do?
 - Create a creditor group
 - Immediately raise issues at the 341 mtg of creditors
 - Use Rule 4001 wisely to take deposition inquiry

Issue: Some Recent Collection Trends

- Customer Efforts to set up monthly payments
- Customer Efforts to blame Non-Op WIPs (not new!)
- Customers reluctance or inability to raise adequate funds for shale completion
- What is your experience?

New Example of a Frac Job Dispute

Operator Claims:

- Water Hauling, Frac Tank Rental
- Claim of residual gel, general contamination in the tanks
- Claims of negligence
- Claims of slander for filing lien claim

Initial Investigation Finds:

- Source of water was adjacent waste water treatment plant
- Increased need for biocide/chemicals, and gel volumes
- Incremental Halliburton water cleanup activities
- Incremental time for water cleanup
- Schlumberger evaluation for frac stimulation effectiveness

Issue: Future Litigation Risks

- Loss of Witnesses, b/c they left for \$.50/Hr
- Silica dust exposure
- Contamination of water zones
- Strange Job disputes; i.e., dirty frac tanks?
- Water Use Issues

Thanks PESA-CID Members and Good Luck!

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