The Oil & Gas Renaissance of the Permian Basin

Permian Basin – World Class Petroleum Basin



- 250 miles by 300 miles
- 1st commercial oil accumulation (Westbrook) discovered in 1921
- Over 30 billion barrels of oil produced over last 90 years
- Largest oil and gas producing area in Lower 48
- · Over 1,300 oil reservoirs and 30 plays identified
- Wolfcamp / Wolffork oil shale resource play could be one of the largest shale oil resource plays found in onshore U.S.
- Approximately 80% of producing reservoirs < 10,000'
- ~500 US rigs are active in the Permian Basin

Petroleum Geology

Oil is typically found in Sandstone or Limestone rocks.

Sandstone is rock composed of sand size grains laid down in sedimentary basins and lithified over long periods of burial.

The sand can be from wind blown deposits, fluvial (river) deposits or from shoreline deposits.

Limestone is a rock formed by chemical precipitation in shallow seas and includes ancient reefs.

Petroleum Geology

Sandstones and Limestones have porosity (voids) where oil and gas can collect and they have traditionally been referred to as reservoir rocks.

 Shale is finer grained, fissile rock that has much less porosity.

Shale can be very high in organic content and has traditionally been referred to as a source rock for oil and gas.

Paradigm Shift

- Today advances in drilling and completion technologies, horizontal drilling and hydraulic fracturing, have made it possible for shale to produce oil and gas.
- Shale is no longer just a source rock from which oil migrates into reservoir rocks.
- Thanks to technology shale is now a source and producing (reservoir) rock.
- Shale is leading the oil and gas production renaissance in the Permian Basin and USA.



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







Permian Basin - Base of the Wolfcamp



The Technology







Unconventional

PERMIAN BASIN UNCONVENTIONAL PLAYS



Distribution of US Lower 48 Oil Fields Ranked in the Top 50



Wasson

Elk Hills

Spraberry is the Largest Oil Field in the Lower 48 States



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2) Based on 2008 data from Railroad Commission of Texas

http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MzY3MTM4fENoaWxkSUQ9MzYyNjMyfFR5cGU9MQ==&t=1

Spraberry - Stacked Pay Oil Resource Play

- Approximately 4,000' of gross pay interval from ~6,000' to 10,000'
- Comprised of 4 main traditional pay zones

TARGET COMPLETION ZONES "SPRABERRY" WELL "WOLFBERRY" WELL **UPPER SPRABERRY** YES YES LOWER SPRABERRY YES YES DEAN YES YES WOLFCAMP YES YES **DEEP WOLFCAMP** NO YES

 Additional pay from non-traditional organic rich shale/silt zones



Clearfork

Upper

~700 ft

~1,500 ft

PIONEER

~4,000'

Ref: Pioneer Natural Resources Investor Presentation: Feb '10;

http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MzY3MTM4fENoaWxkSUQ9MzYyNjMyfFR5cGU9MQ==&t=1



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Wolfberry

- Proven play with robust well performance
- EURs of 120 150 MBOE
- Several hundred drillable locations
- Significant portion of future drilling programs



Ref: Pioneer Natural Resources Investor Presentation: Feb '10;

PIONEER

Unconventional Oil plays

in the

The Delaware Basin

Permian Basin – Horizontal Oil Plays



WESTERN PERMIAN BASIN PLAYS



Unconventional Plays in the Midland Basin

PERMIAN BASIN UNCONVENTIONAL PLAYS



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AREX Wolfcamp Oil Shale Resource Play

Large, primarily contiguous acreage position

Liquids-rich, multiple pay zones 167,000 gross (148,000 net) acres Low acreage cost ~\$500 per acre

500+ MMBoe gross, unrisked resource potential

2,900+ drilling and recompletion opportunities

Early-stage play development

Transitioning Wolfcamp B to development mode

Testing Wolfcamp A and C

Testing tighter well spacing

Preparing field for large-scale development

Broad industry participation de-risking play



Horizontal Wolfcamp Targets



Cline shale



Source: Keith Schaefer, Oil and Gas Investments Bulletin (4/19/12)

Wolfcamp (Case Study), Bone Springs, Cline Shale



http://info.drillinginfo.com/urb/wolfberry/files/2011/02/Stat-Column.png

Schlumberger

Cline Shale

Cline Shale: roughly 9,250 ft below the surface Located along the eastern flank of the Midland Basin It may be the key for energy independence for the U.S. The play is 140 miles north-south, 70 miles east-west **Devon Energy: the formation contains 3.6 Mbbls/sq mile** 9,800 square miles = 30 billion bbls of recoverable oil Bakken reserves are 4.3 billion bbls, Eagle Ford, 7-10 billion bbls

It Takes Water

Water Sources



