

How Oil Drives the Houston Economy – And the Economy Drives Real Estate



Harold Hunt, PhD
Real Estate Center at Texas A&M
College Station, Texas
hhunt@tamu.edu

How Large is the Energy Industry in Houston?

Recent estimates by the **Bureau of Economic Analysis (BEA)** say:

- The **Mining & Logging (O&G)** sector in Houston accounted for **19.8%** of the region's GDP.
- When you add in **chemicals, refining, and oilfield equipment manufacturing**, energy accounts for **32.0%** of the region's GDP.
- When you add in **fabricated metal products, P/L transportation, and engineering services**, energy accounts for **38.1%** of the region's GDP.

Where is the Energy Sector Headed?

The most critical question for real estate professionals still seems to be:

- How long will the drilling activity in Texas last?

First, a Quick Overview of Fracking

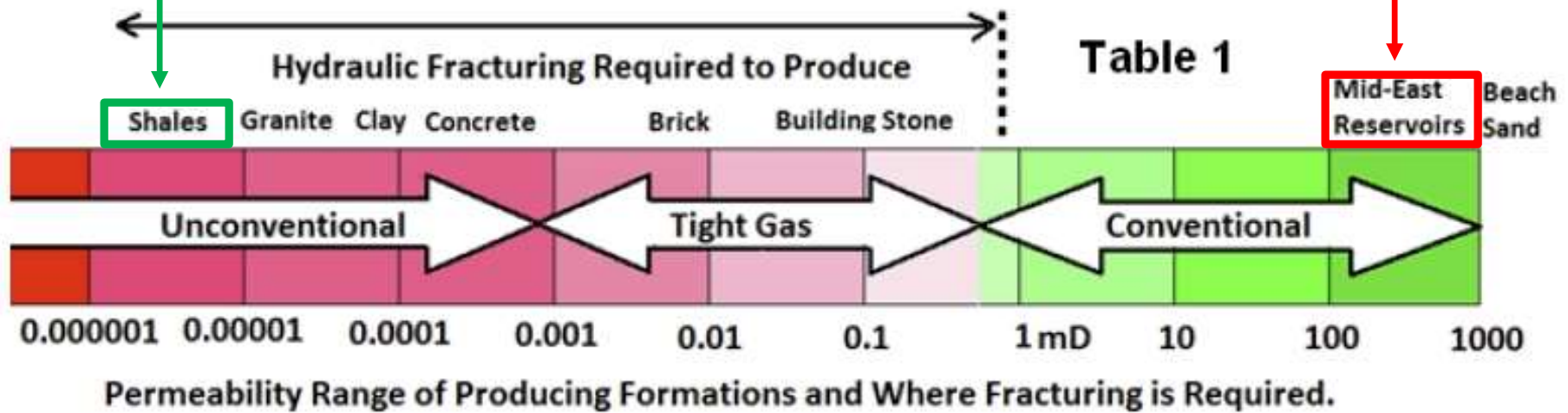
Two Definitions

- **Porosity** - the percentage of void space in a material.
- **Permeability** – The property of a porous material to permit a liquid or gas to pass through it.

Permeability of Shale

Shales

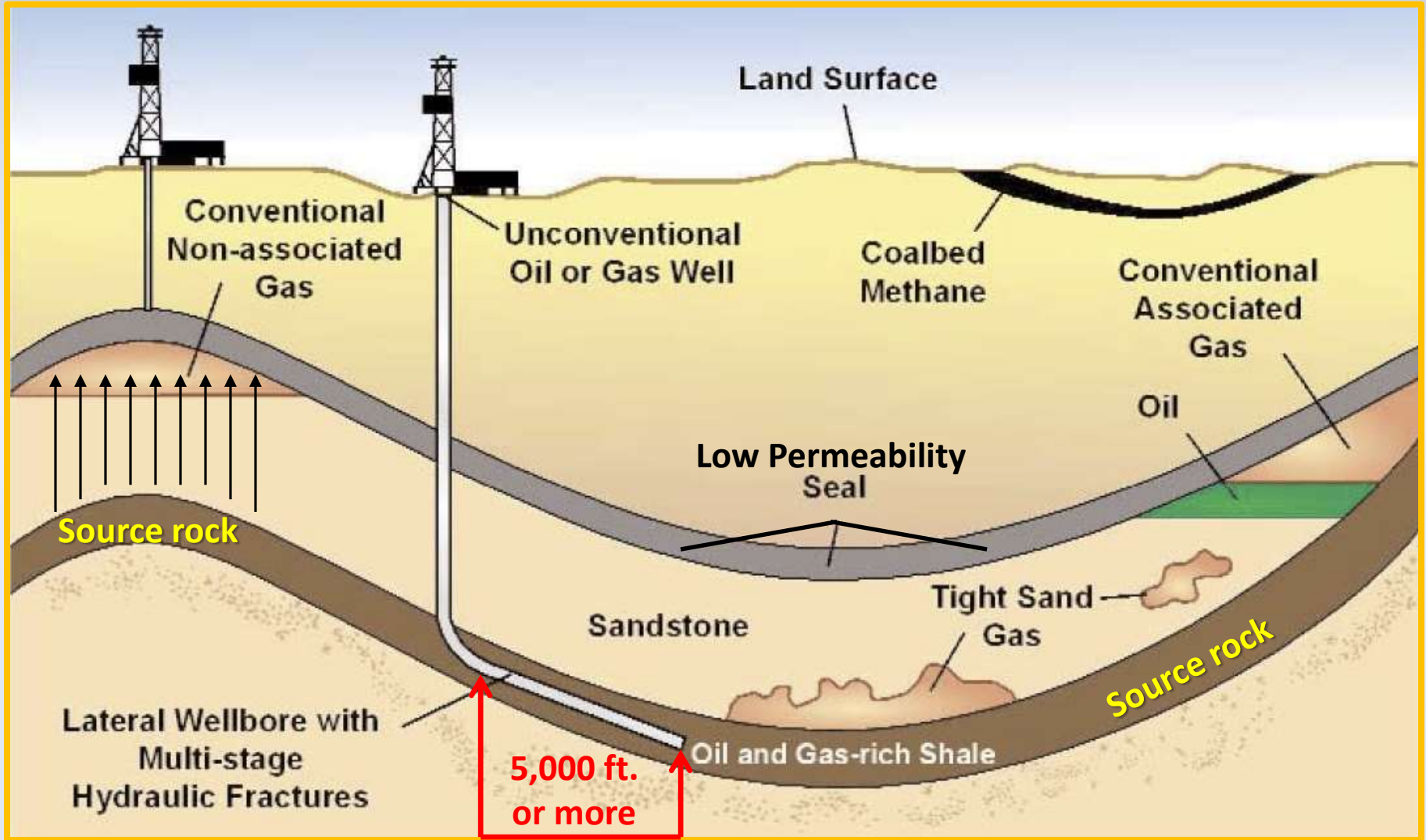
Mid-East Reservoirs



Not Very Permeable

Very Permeable

Conventional vs Unconventional Drilling



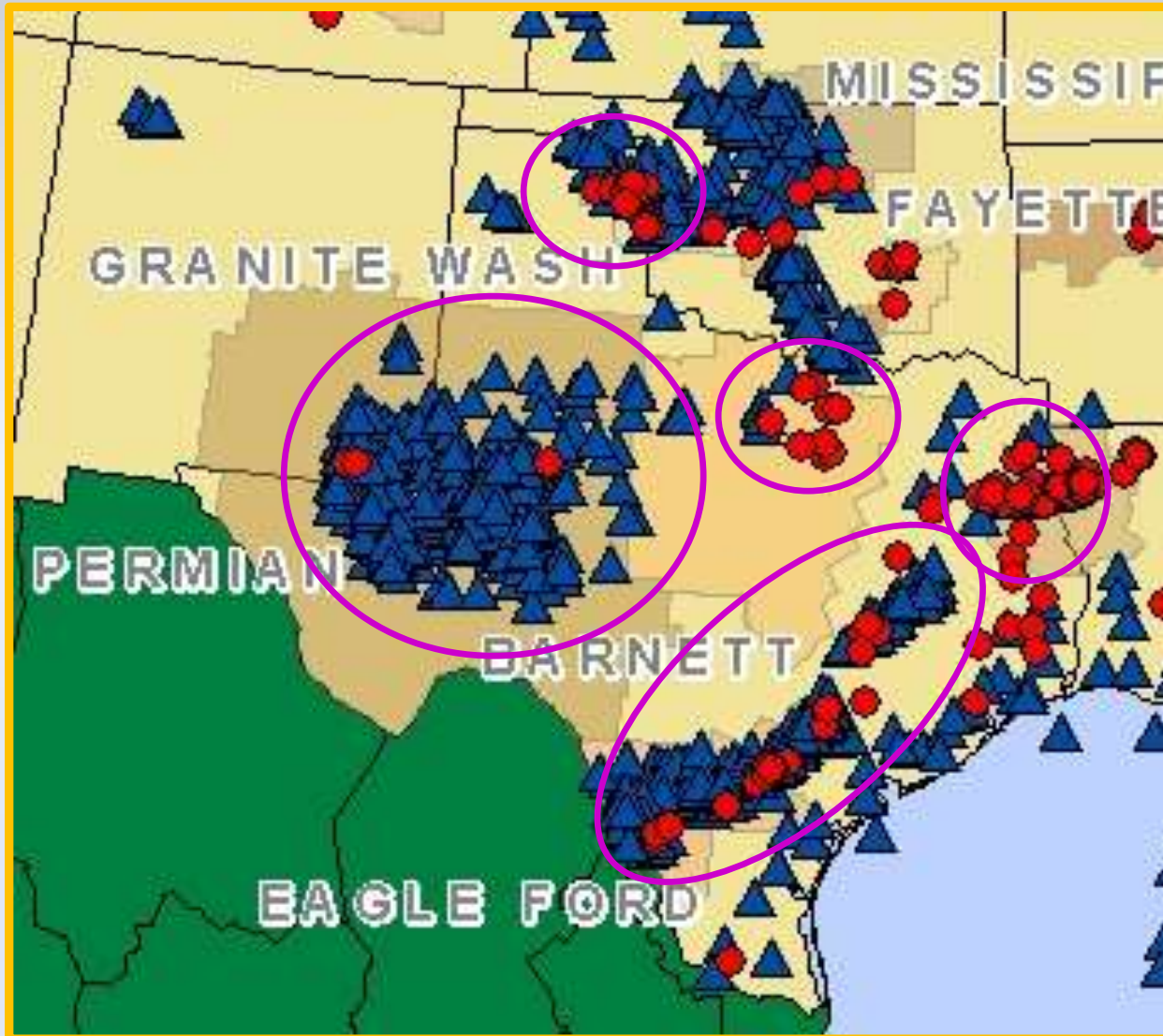
Equipment to Fracture a Well



Statewide Drilling Activity Today

Active Drilling Rigs in Texas

(As of October 17th, 2014)



Source: Baker Hughes

Rig Counts

(Land Rigs: **October 17th, 2014** vs **October 18th, 2013**)

Area	Total Rigs		Gas Rigs		Oil Rigs		% Horizontal Rigs	
	Oct. '14	Oct. '13	Oct. '14	Oct. '13	Oct. '14	Oct. '13	Oct. '14	Oct. '13
U.S.	1,918	1,733	328	372	1,590	1,361	71%	63%
Texas	898	815	80	110	818	705	67%	61%
Permian	561	447	3	7	558	440	59%	44%
Eagle Ford	209	221	12	30	197	191	92%	89%

Shale Drilling Activity Ramp-Up in the Eagle Ford

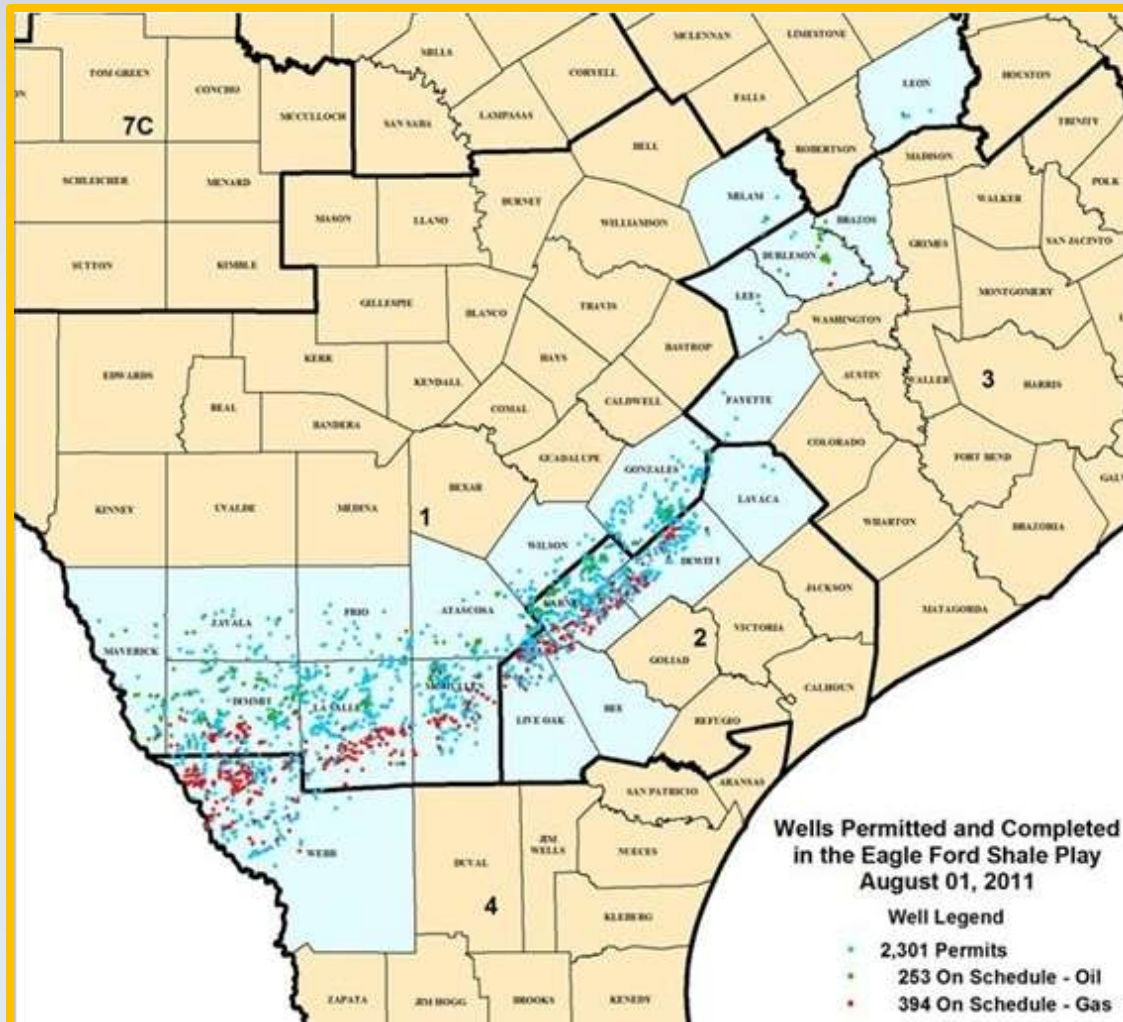
My Early Prediction of the Length of Eagle Ford Drilling Activity

The **Dallas Federal Reserve** reported that **5 mil.** acres of the Eagle Ford are under lease.

So I assumed:

- **4 mil.** acres/**200** acres drained per well = **20k total wells**
- **250** rigs x **5** wells drilled per yr. = **1,250 wells per yr.**
- 20k wells needed/1,250 wells per yr. = **16 years to drill**

Completed Wells in the Eagle Ford



As of Aug, 2011:

263 Producing Oil Wells

394 Producing Gas Wells

657 Total Producing Wells
after 3 years of drilling.

Completed Wells in the Eagle Ford

11 Months Later...

As of July, 2012:

1,690 Producing Oil Wells

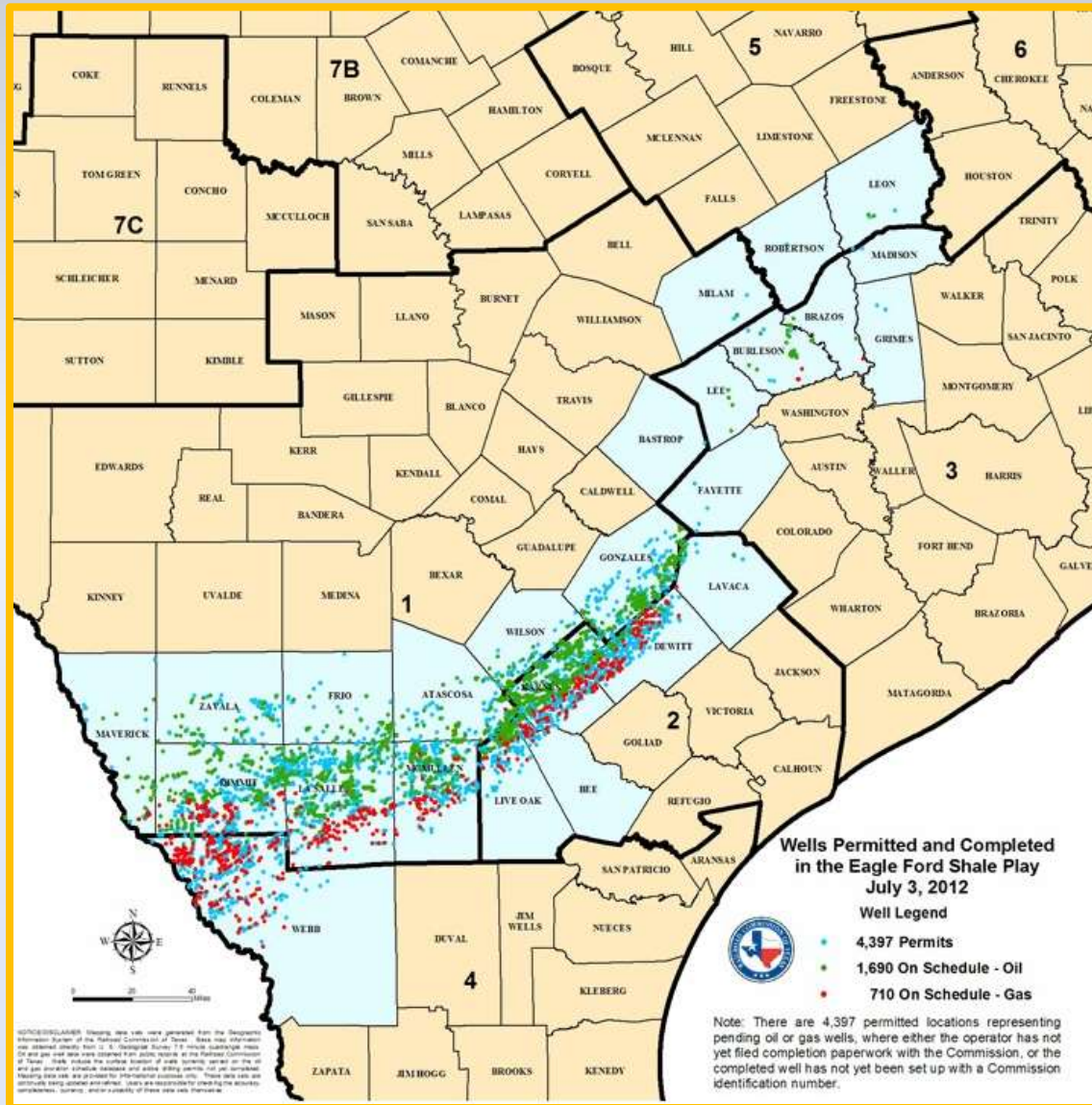
710 Producing Gas Wells

An Increase of:

1,427 Producing Oil Wells

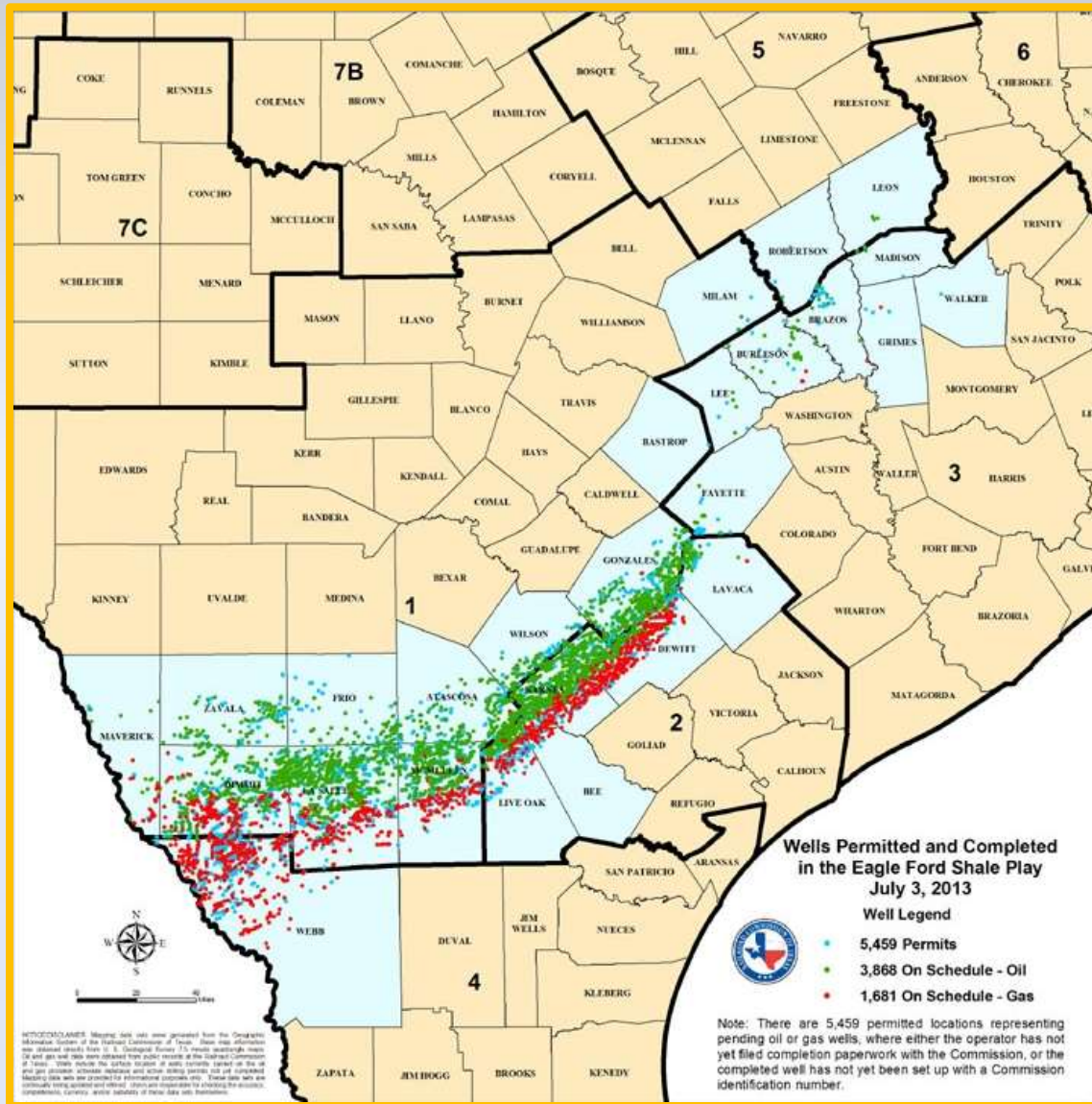
316 Producing Gas Wells

Total Increase: 1,743 wells



Source: Texas Railroad Commission

Completed Wells in the Eagle Ford



12 Months Later...

As of July, 2013:

3,868 Producing Oil Wells

1,681 Producing Gas Wells

An Increase of:

2,178 Producing Oil Wells

971 Producing Gas Wells

Total Increase: 3,149 wells

Source: Texas Railroad Commission

Completed Wells in the Eagle Ford

12 Months Later...

As of July, 2014:

6,414 Producing Oil Wells

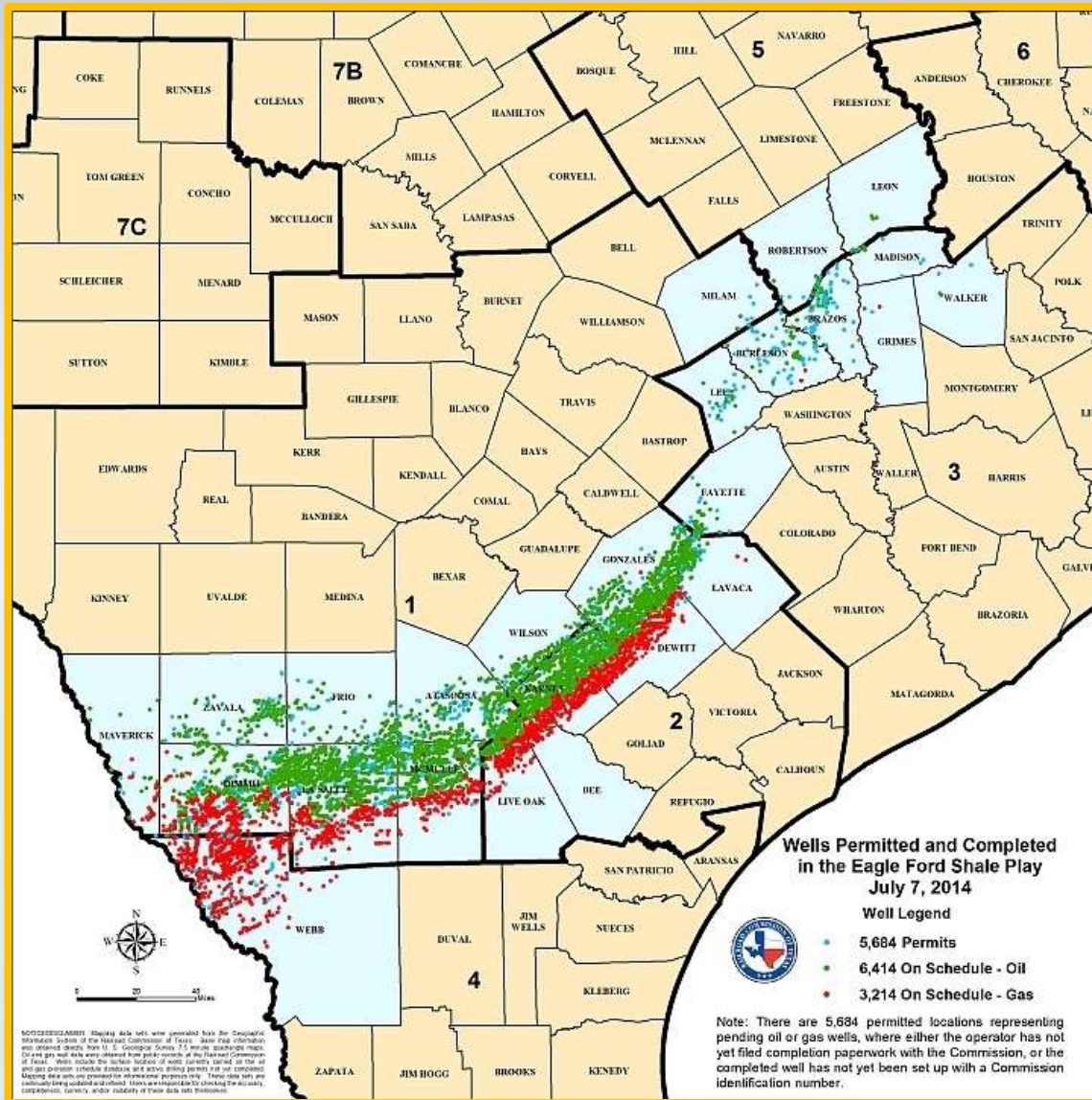
3,214 Producing Gas Wells

An Increase of:

2,546 Producing Oil Wells

1,533 Producing Gas Wells

Total Increase: 4,079 wells



Source: Texas Railroad Commission

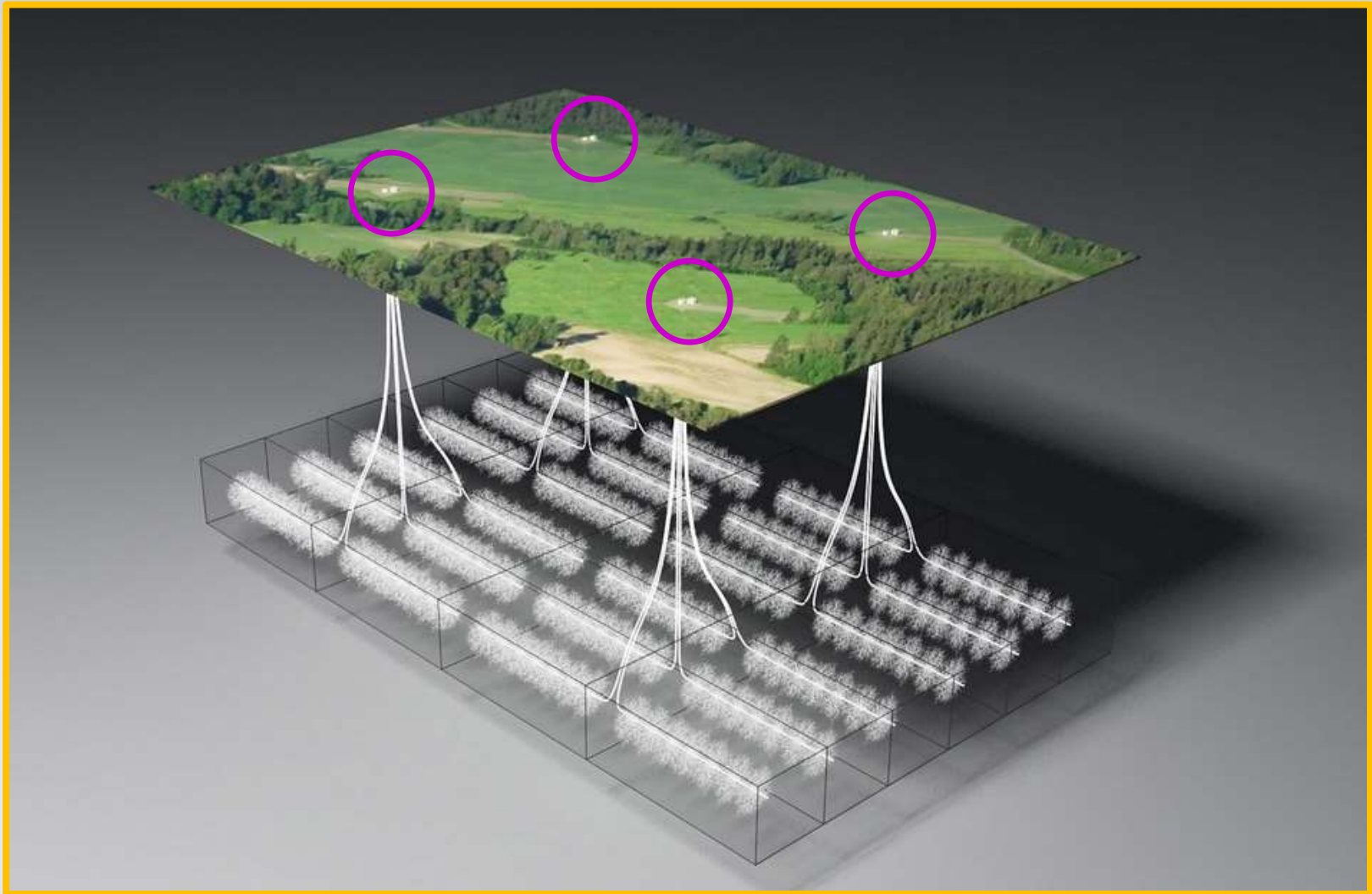
Why the Huge Ramp-up?

Several Factors Affect the Speed and Number of Wells that Get Drilled

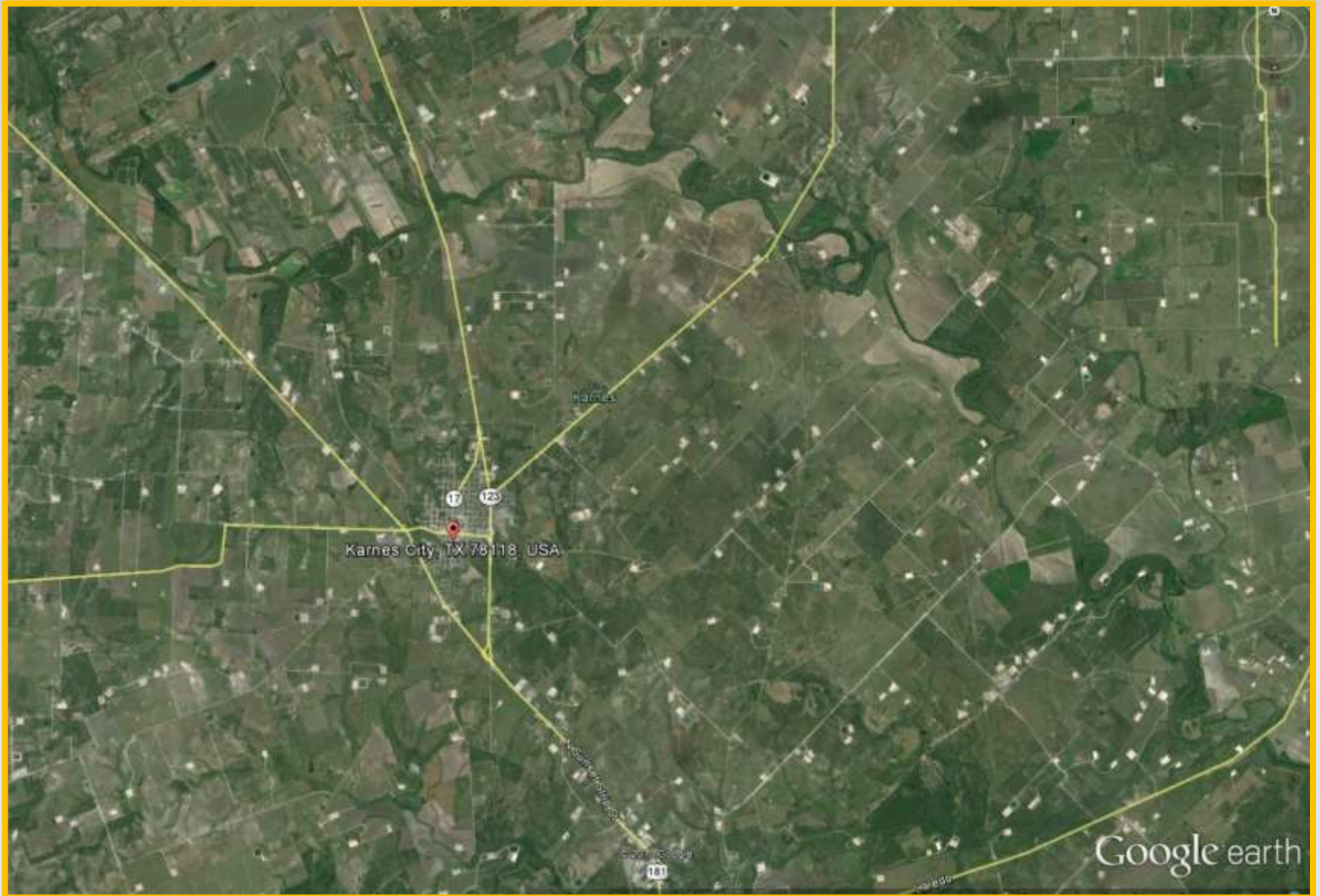
- 1) Drilling one well to “hold a field by production” giving way to “pad drilling” where multiple wells are drilled from one drillsite, saving time and money.
- 2) Drilling rigs that “walk” or move along rails will significantly reduce the downtime between drilling a well.
- 3) The well spacing continues to tighten, leading to more producing wells on a given amount of acreage.
- 4) Tapping other pay zones will extend the drilling activity in fields.

1) Evolution Toward Pad Drilling

Pad Drilling Example



Karnes Co. Drilling Pads



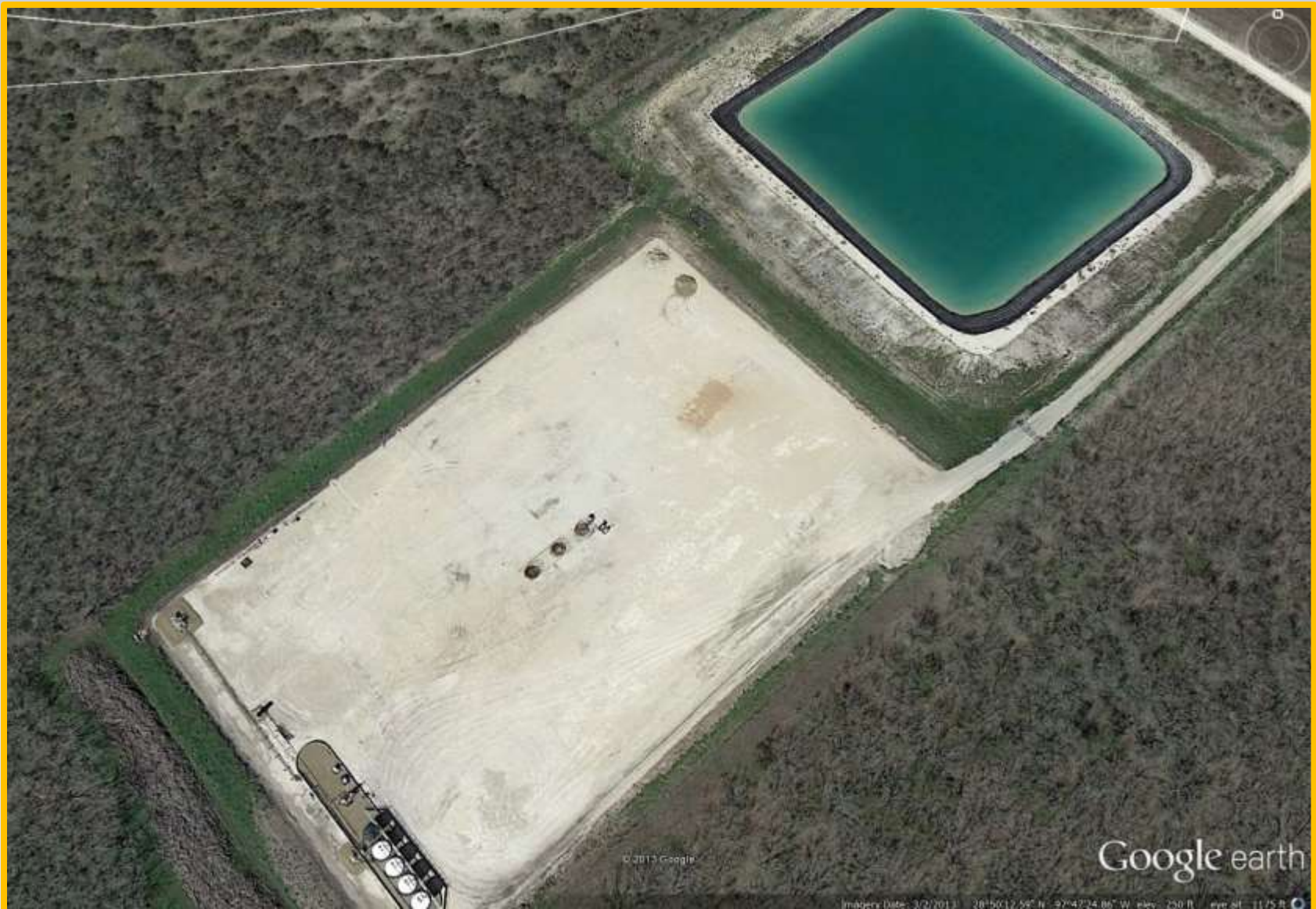
Gonzales Co. Drilling Pads



2 Wells On One Pad in Gonzales Co.



3 Wells On One Pad in Gonzales Co.



4 Wells Just Drilled by EOG in Gonzales Co.

(using FracFocus.org)



22 Wells On One Pad



Twenty-two wells, 75 wireless instruments, and one pad controller: Wireless automation solutions with advanced automation allow efficient monitoring and control of plunger lift wells. (Images courtesy of Flow Data Inc.)

2) Moving the Rigs Gets Faster

Walking Rigs



B-Series rigs are each equipped with a Columbia Walking System (in photo). The system allows the rig to travel up to 100 ft (30.5 m) without moving the backyard and with full setback. A well-to-well move can be accomplished in as little as one hour, and it can return to a previously drilled well with an accuracy of plus or minus one-sixteenth of an inch. (Image courtesy of Nabors Drilling USA)

Rigs Moving on Rails



Fig. 1. The PaDSRig (Production and Drilling System Rig) is designed for drilling multiple well bores from a single pad location, skidding along rails.

Rigs Moving on Rails



Piping Moves With Rig Movement



Increasing Efficiency Begins to Show Up

U.S. Land Well Count by Basin

Date	Eagle Ford	Granite Wash	Haynesville	Permian	Total Wells U.S.Land
Q1 - 2012	876	160	184	2,302	9,173
Q2 - 2012	932	178	109	2,497	9,582
Q3 - 2012	1,024	155	84	2,402	9,411
Q4 - 2012	974	168	92	2,196	8,658
Q1 - 2013	1,044	141	109	2,169	8,534
Q2 - 2013	1,089	150	98	2,260	9,011
Q3 - 2013	1,096	170	103	2,351	9,075
Q4 - 2013	1,171	148	94	2,351	9,083
Q1 - 2014	1,178	133	102	2,405	8,966
Q2 - 2014	1,195	166	118	2,681	9,456
Q3 - 2014	1,168	182	126	2,701	9,566

U.S. Land Rig Count by Basin

Date	Eagle Ford	Granite Wash	Haynesville	Permian	Total Rigs U.S.Land
Q1 - 2012	234	86	91	482	1,947
Q2 - 2012	251	90	59	516	1,923
Q3 - 2012	242	80	41	513	1,855
Q4 - 2012	228	71	37	484	1,759
Q1 - 2013	232	69	41	470	1,706
Q2 - 2013	230	70	38	469	1,709
Q3 - 2013	233	70	41	463	1,709
Q4 - 2013	225	60	40	463	1,697
Q1 - 2014	221	54	43	491	1,724
Q2 - 2014	217	65	44	545	1,796
Q3 - 2014	206	70	44	559	1,842

U.S. Land Wells/Rig by Basin

Date	Eagle Ford	Granite Wash	Haynesville	Permian	Total U.S.Land
Q1 - 2012	3.74	1.85	2.02	4.77	4.71
Q2 - 2012	3.72	1.97	1.84	4.84	4.98
Q3 - 2012	4.22	1.93	2.04	4.68	5.07
Q4 - 2012	4.26	2.36	2.47	4.54	4.92
Q1 - 2013	4.51	2.05	2.66	4.62	5.00
Q2 - 2013	4.73	2.15	2.55	4.82	5.27
Q3 - 2013	4.70	2.43	2.51	5.08	5.31
Q4 - 2013	5.20	2.47	2.35	5.08	5.35
Q1 - 2014	5.33	2.46	2.37	4.90	5.20
Q2 - 2014	5.51	2.55	2.68	4.92	5.27
Q3 - 2014	5.67	2.60	2.86	4.83	5.19

2012 Q1

Started 1 well every 24 days →

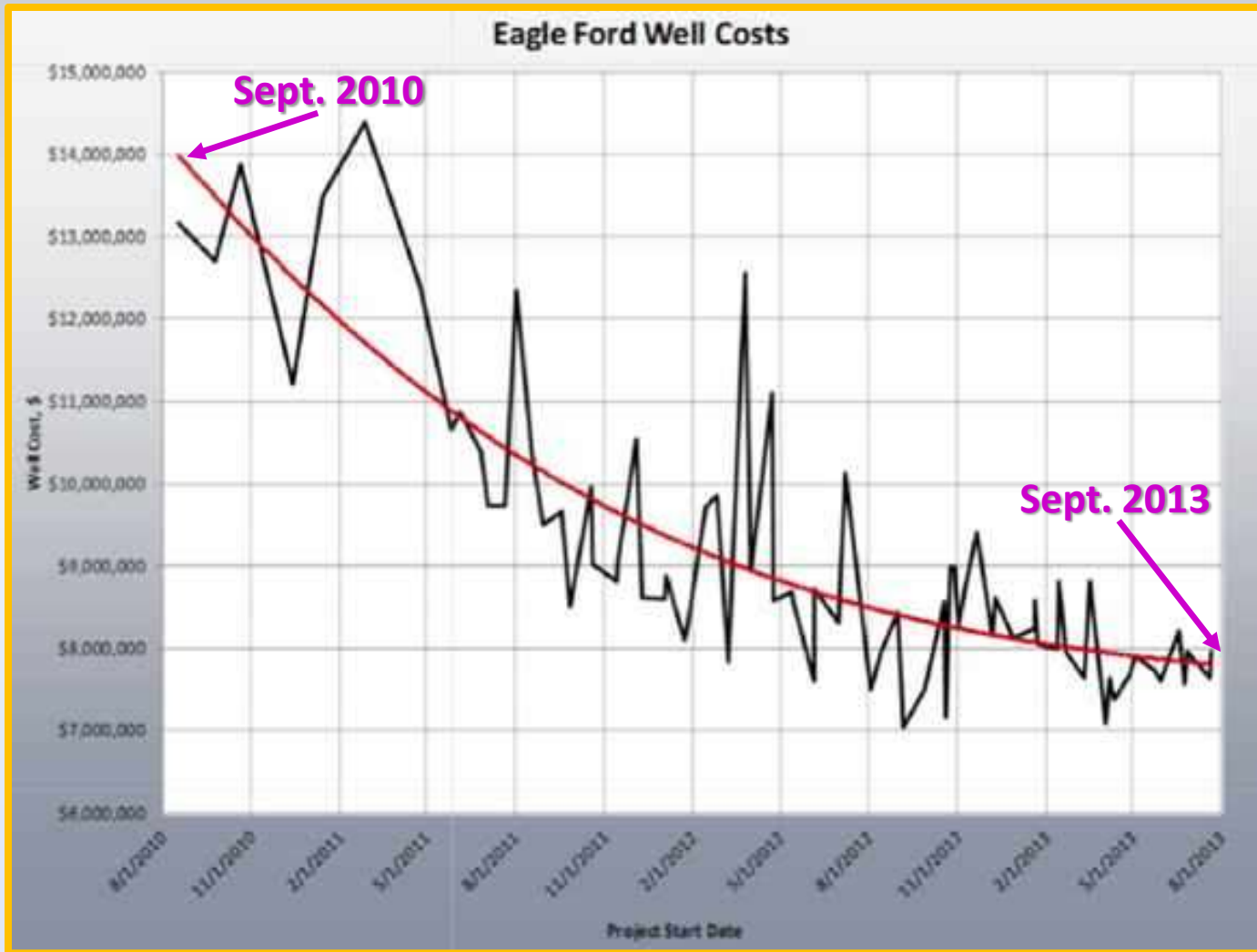
2014 Q3

Started 1 well every 16 days →

51.6% 40.5% 41.5% 1.2% 10.2%

Source: Baker Hughes Quarterly Well Count Report

Well Costs Have Dropped as a Result of Increased Efficiency



3) Well Spacing Gets Tighter

Rosetta Resources Map of Its Well Spacing Plan

Gates Ranch has been the main contributor to that growth with only 17% of the ultimate development on production at the end of 2Q ...

Summary

- 26,500 net acres in Webb County
- 72 completions as of 6/30/2012
 - 1Q 2012: 10 completions
 - 2Q 2012: 6 completions
- 356 well locations remaining under current spacing assumptions

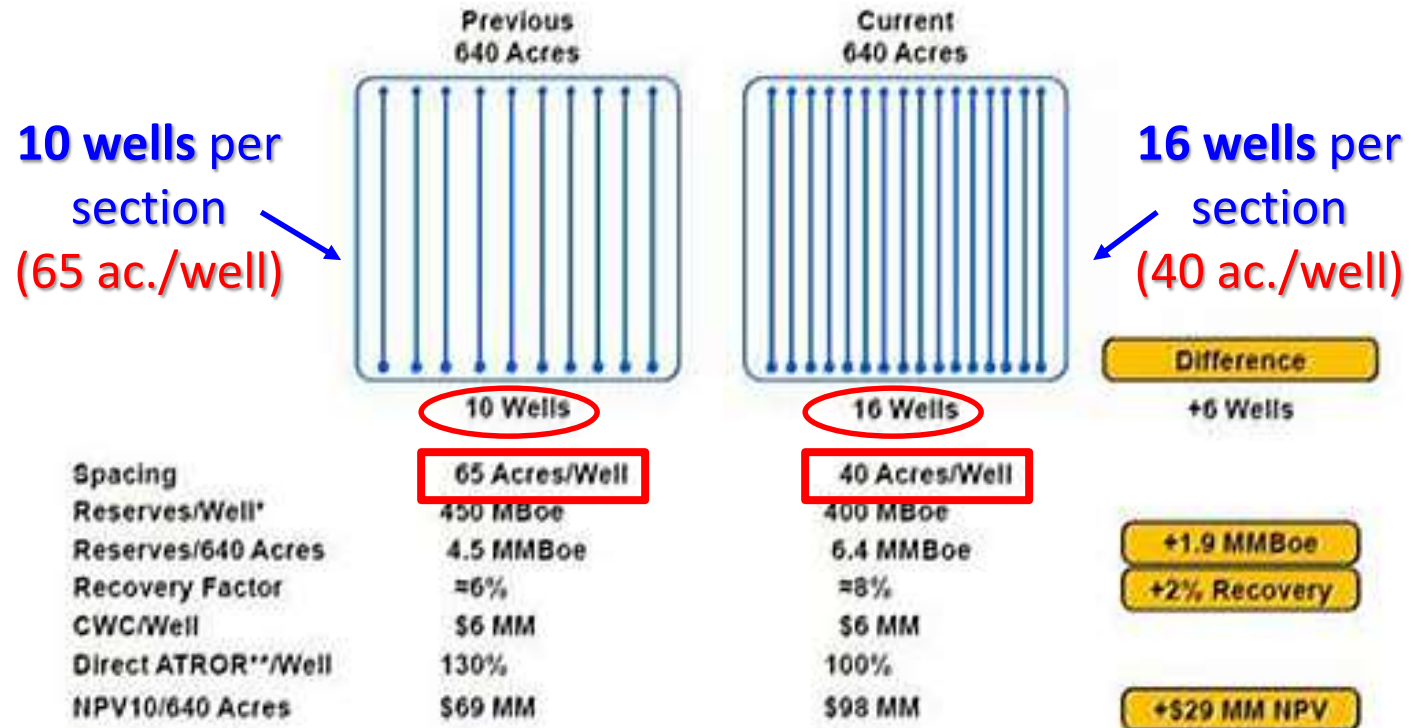
Average Well Characteristics

- Well Costs: \$7.5 - \$8.0 million
- Spacing: 475 feet apart or 55 acres



EOG and Others Have Pushed Downspacing, Dramatically Increasing the Well Count

EOG Resources Maximizing NPV of the Eagle Ford



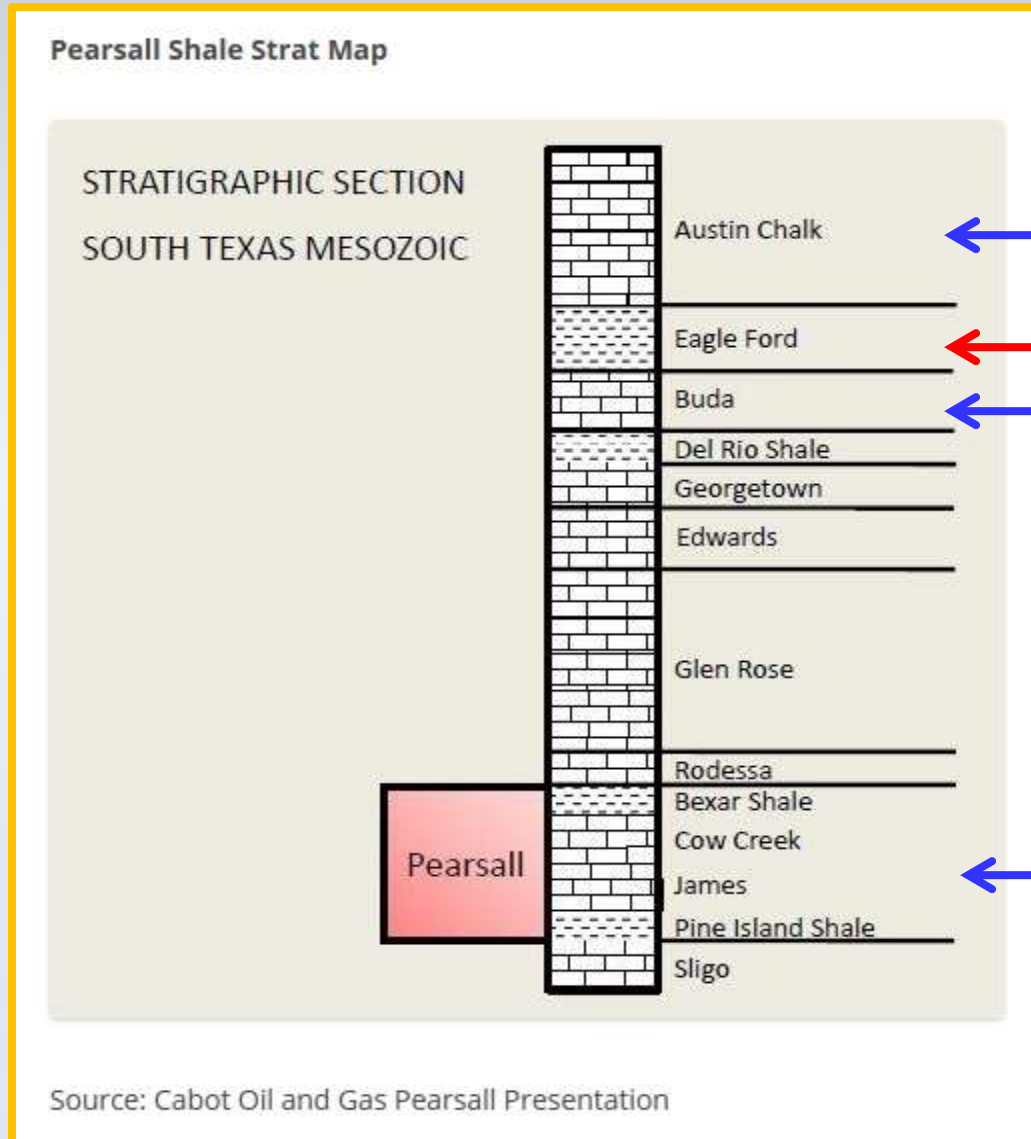
* Net after royalty

** See reconciliation schedule.

(Source: EOG Resources March 2013 Investor Presentation)

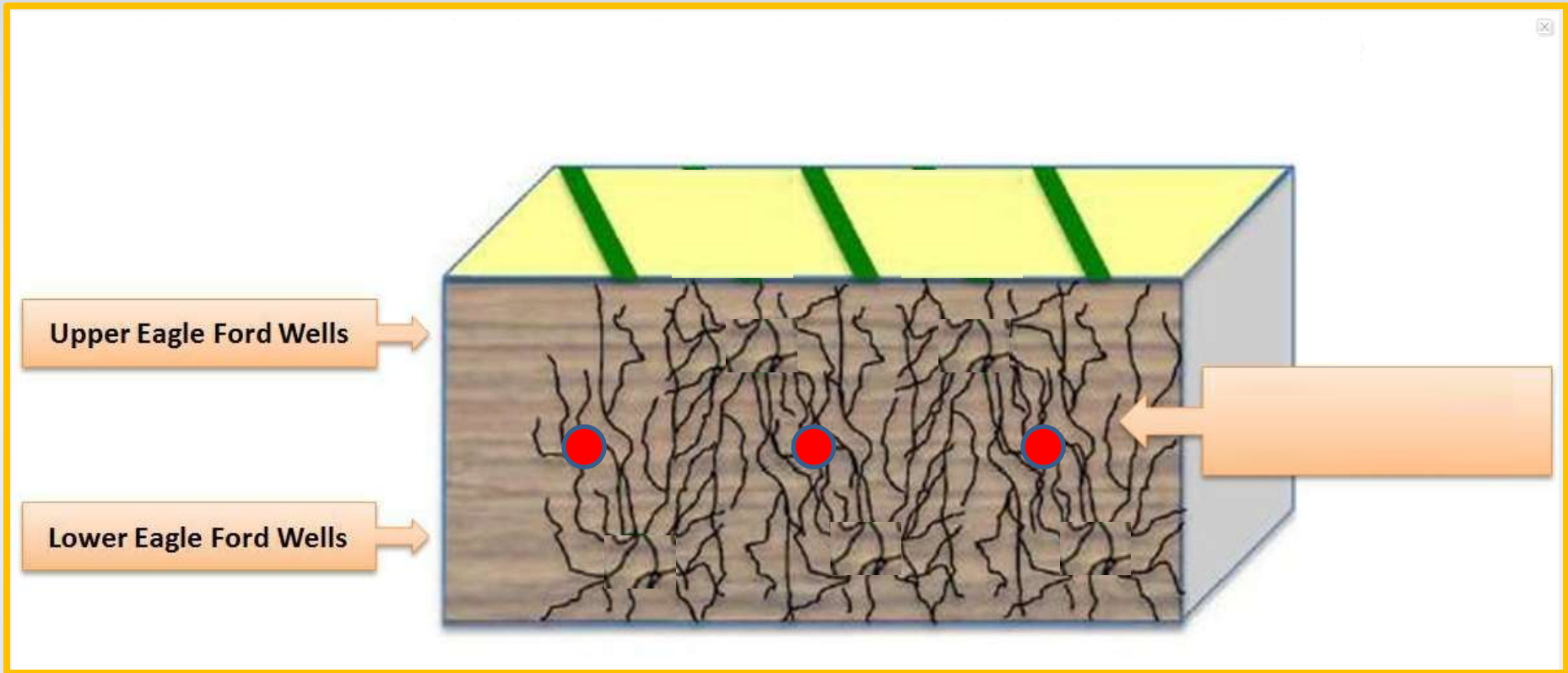
4) Tapping Other Pay Zones in the Future

Multiple Payzones Could Extend the Drilling Activity in a Play



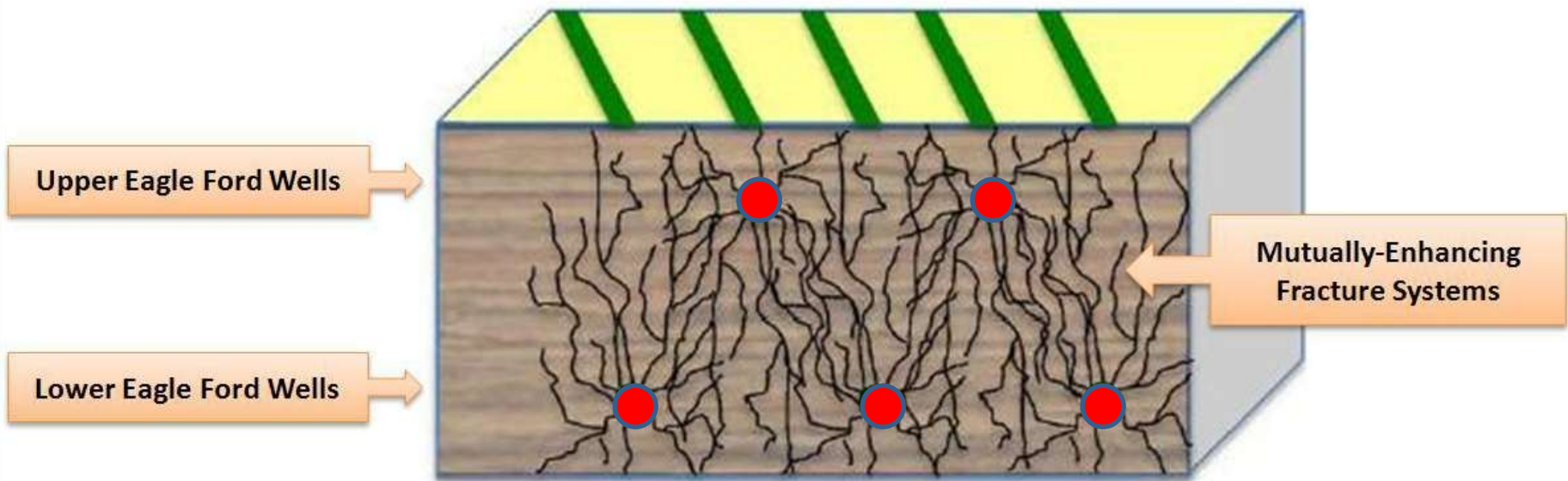
Also Experimenting With
“Stacked Lateral” Development

Stacked Laterals Being Tested by Rosetta Resources in the Gates Ranch Field



Stacked Laterals Being Tested by Rosetta Resources in the Gates Ranch Field

Schematic of Stacked-Lateral Development In the Eagle Ford Shale



Finally, there may also be “secondary recovery”
(ex. re-fracking) activity on
early wells now in decline

My Revised Guess of Future Eagle Ford Drilling Activity

The **Dallas Federal Reserve** reported that **5 mil.** acres of the Eagle Ford are under lease.

So my latest guess is:

- 4 mil. acres/**80** acres drained per well = **50k total wells**
- **200** rigs x **20** wells drilled per yr. = **4,000 wells per yr.**
- 50k wells needed/4,000 wells per yr. = **12.5 years to drill**

* Without considering: **1) multiple payzones or 2) secondary recovery.**

A Quick Note on the Permian Basin

The Gift That Keeps On Giving

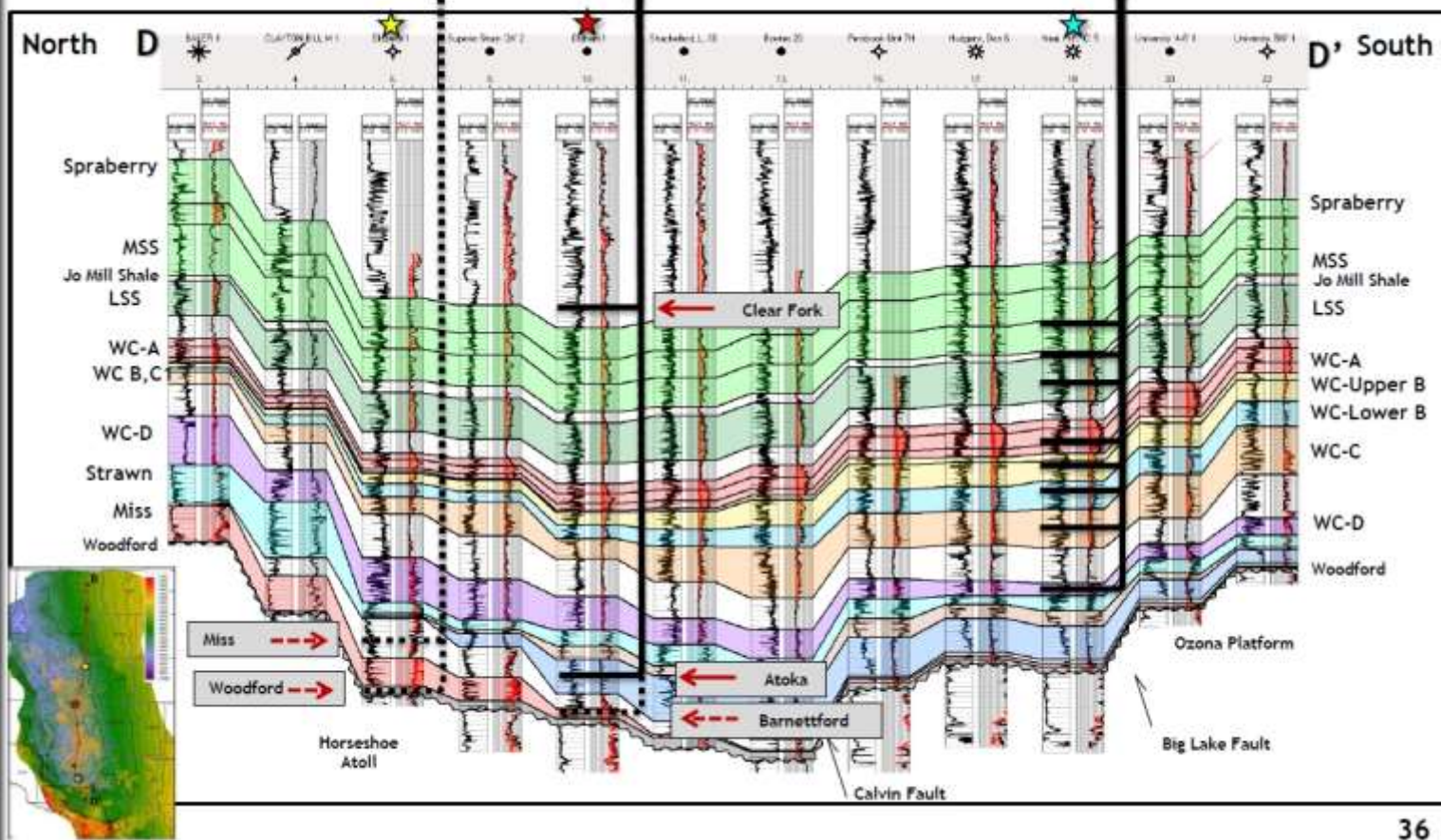
Large Number of Multiple Payzones in the Permian

Regional Cross Section D-D'

PIONEER
NATURAL RESOURCES

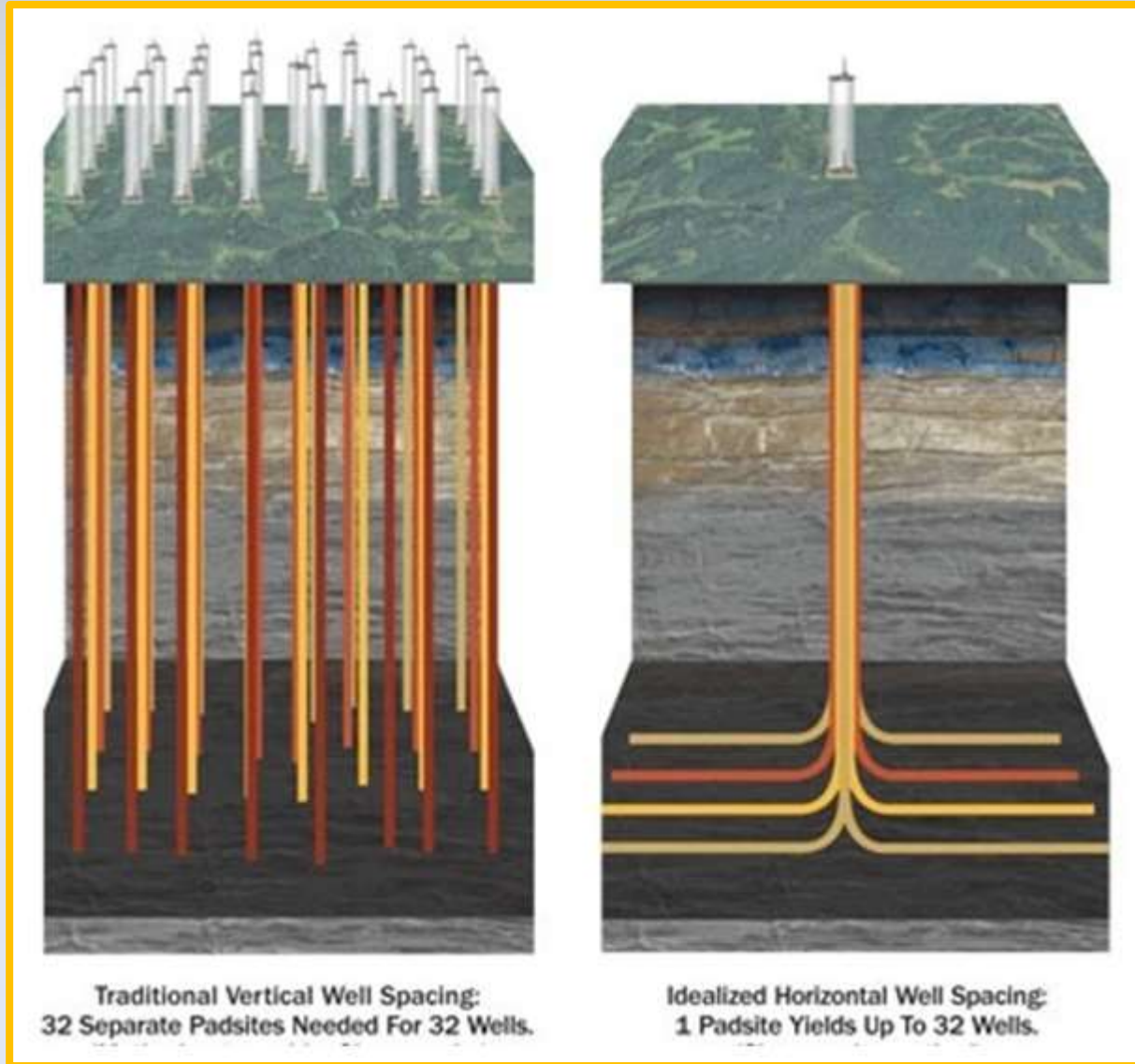
- Successful Horizontal Wells in the Play
- Future Horizontal Play

- 13 horizontal play intervals identified (so far)
- 10 intervals have been tested successfully
- 3 additional intervals remain to be tested

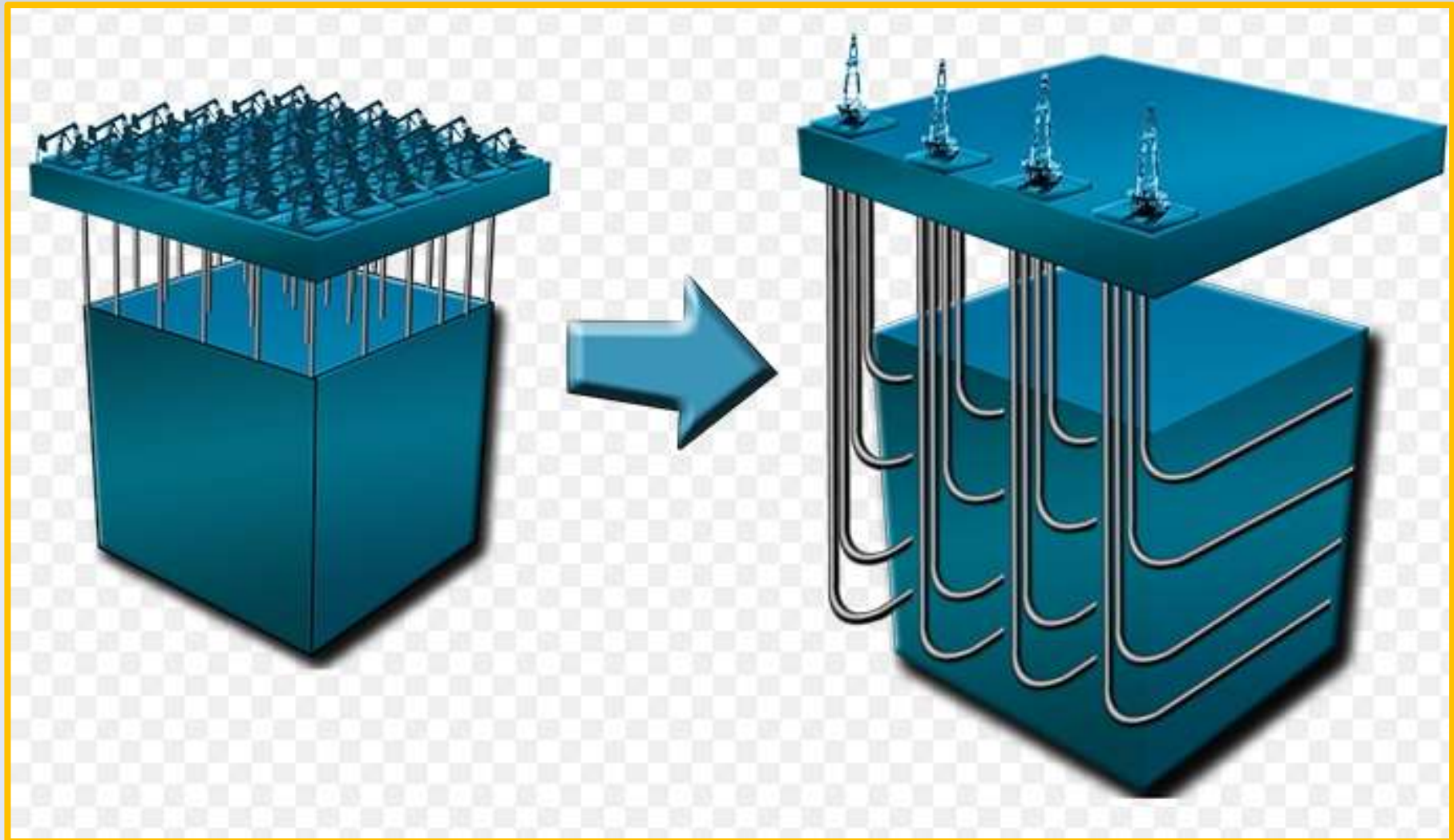


The Permian
13 Payzones
identified so far
by Pioneer

Old Vertical Well Field Model versus Horizontal Wells Using Pad Drilling



Horizontal Wells Using Pad Drilling in Multiple Stacked Plays



Does 15 to 20 Years of “Drilling Inventory”
Mean We Will Have 15 to 20 Years of
Uninterrupted Drilling Activity?

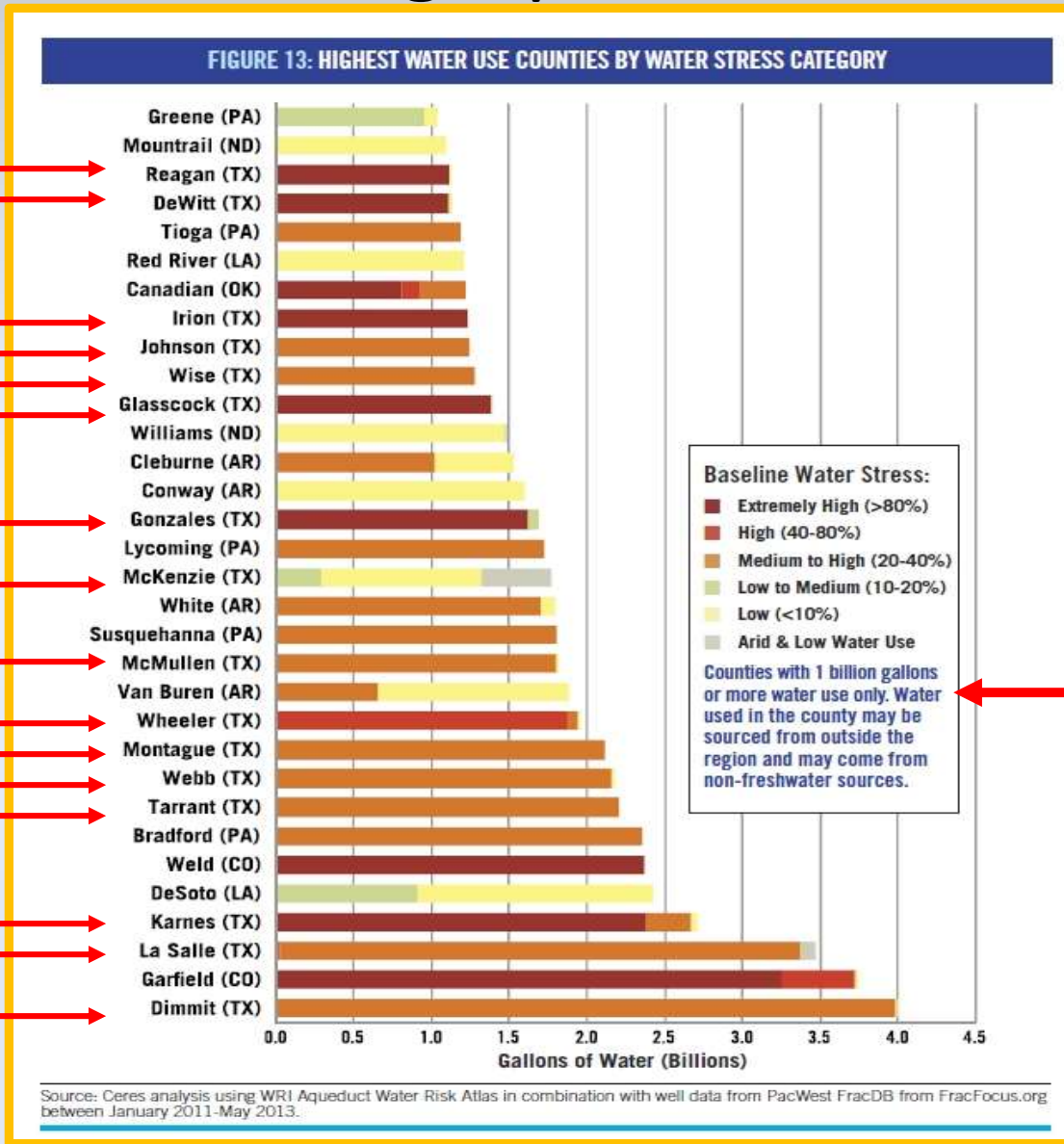
What Could Derail This O&G “Boom”

- A major breakthrough in **renewables** (wind, solar, etc.)
- **Water availability** or **water contamination** endangering aquifers or surface

Top 32 Highest Water Use Counties for Hydraulic Fracking Operations in the U.S.

Texas had 16 of top 32 U.S. counties from **Jan. 2011 to May 2013**

4 bil. Gallons in Dimmit Co.



Can include water sourced outside the county.

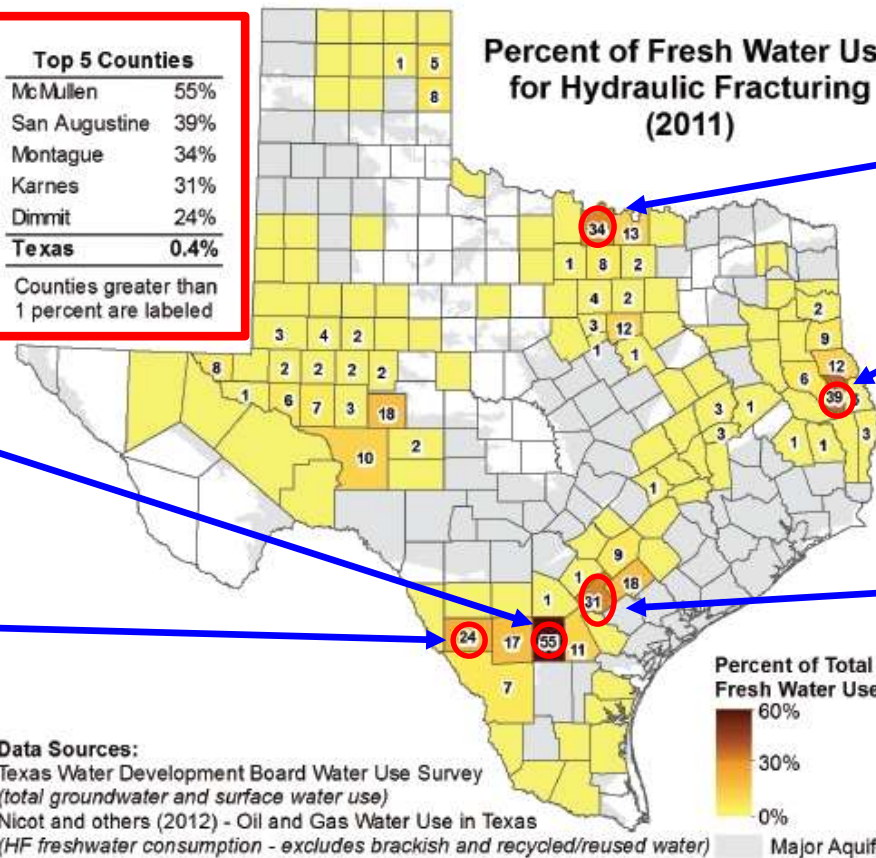
May be non-fresh water as well.

“Freshwater” Use for Fracking is a Significant % in a Few Texas Counties

Figure 1

Top 5 Counties	
McMullen	55%
San Augustine	39%
Montague	34%
Karnes	31%
Dimmit	24%
Texas	0.4%
Counties greater than 1 percent are labeled	

Percent of Fresh Water Use for Hydraulic Fracturing (2011)



Montague Co: 34%

San Augustine Co: 39%

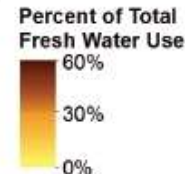
Karnes Co: 31%

McMullen Co: 55%

Dimmit Co: 24%

Data Sources:

Texas Water Development Board Water Use Survey (total groundwater and surface water use)
 Nicot and others (2012) - Oil and Gas Water Use in Texas (HF freshwater consumption - excludes brackish and recycled/reused water)



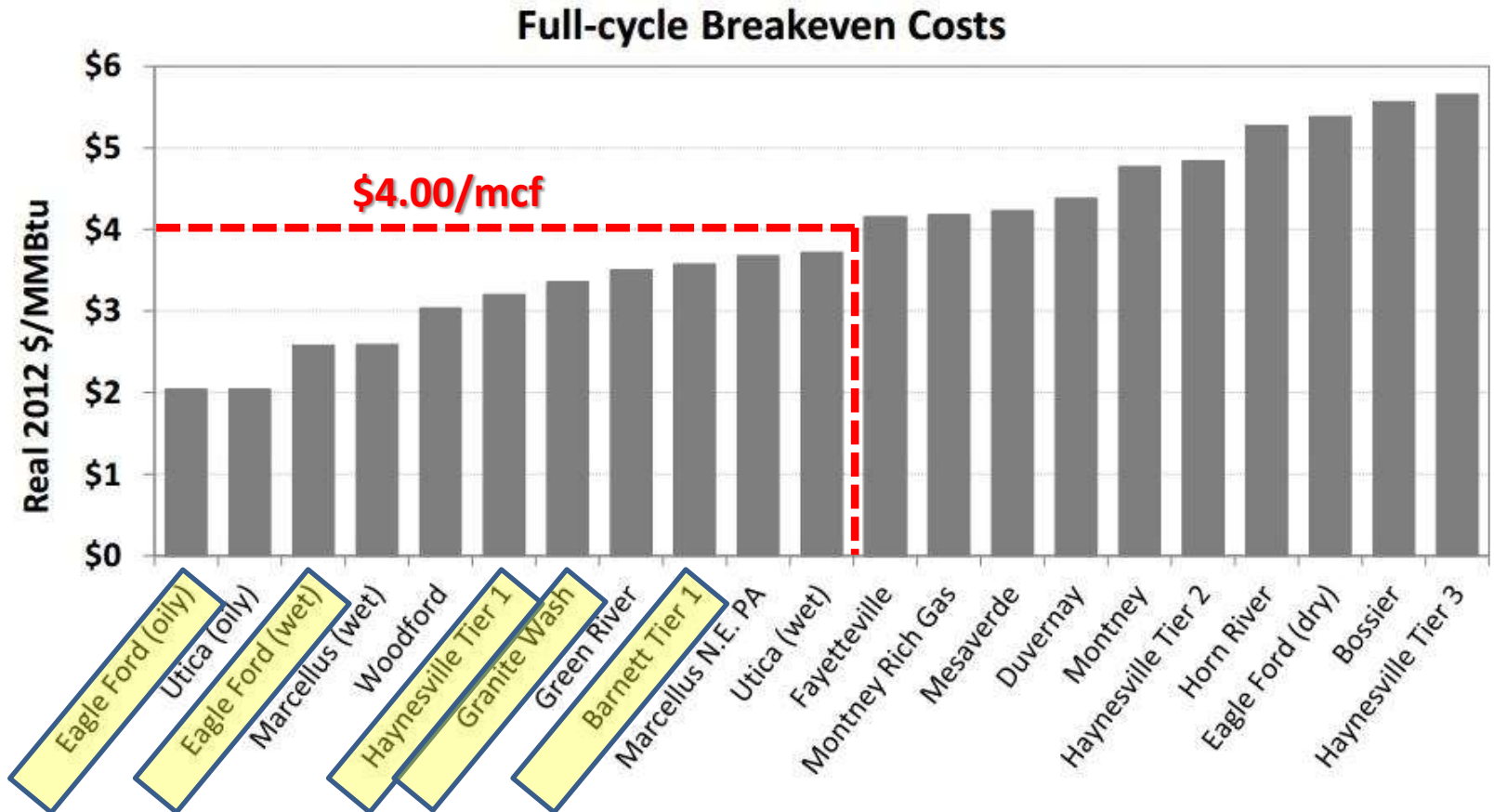
What Could Derail This O&G “Boom”

- A major breakthrough in **renewables** (wind, solar, etc.)
- **Water availability** or **water contamination** endangering aquifers or surface
- **Govt. involvement** becomes too onerous
 - (ex. **EPA** severely regulates: **water disposal, air quality, frack fluids**)
 - (ex. 2. **U.S. Fish & Wildlife**: finds endangered species in area, such as the *Dunes Sagebrush Lizard* or the *Spot-tailed Earless Lizard*)
- **The big one**: A severe drop in **price**, reducing drilling

Estimates of Breakeven Prices

U.S. Shale Gas Resources by Breakeven Cost

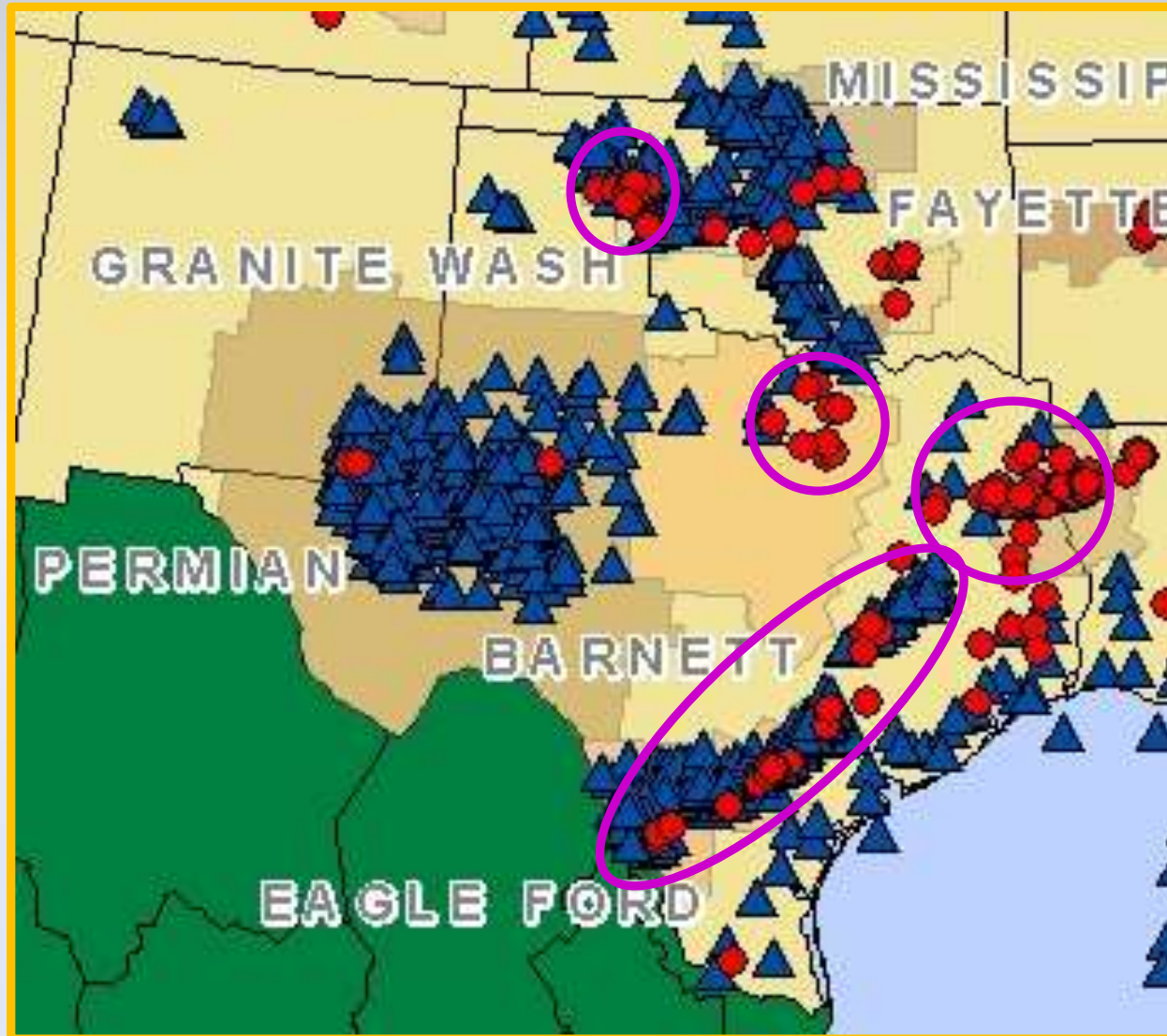
(5 Texas Areas seem to work at \$4.00/mcf or less)



An abundance of resources can be brought to market at \$5 or less

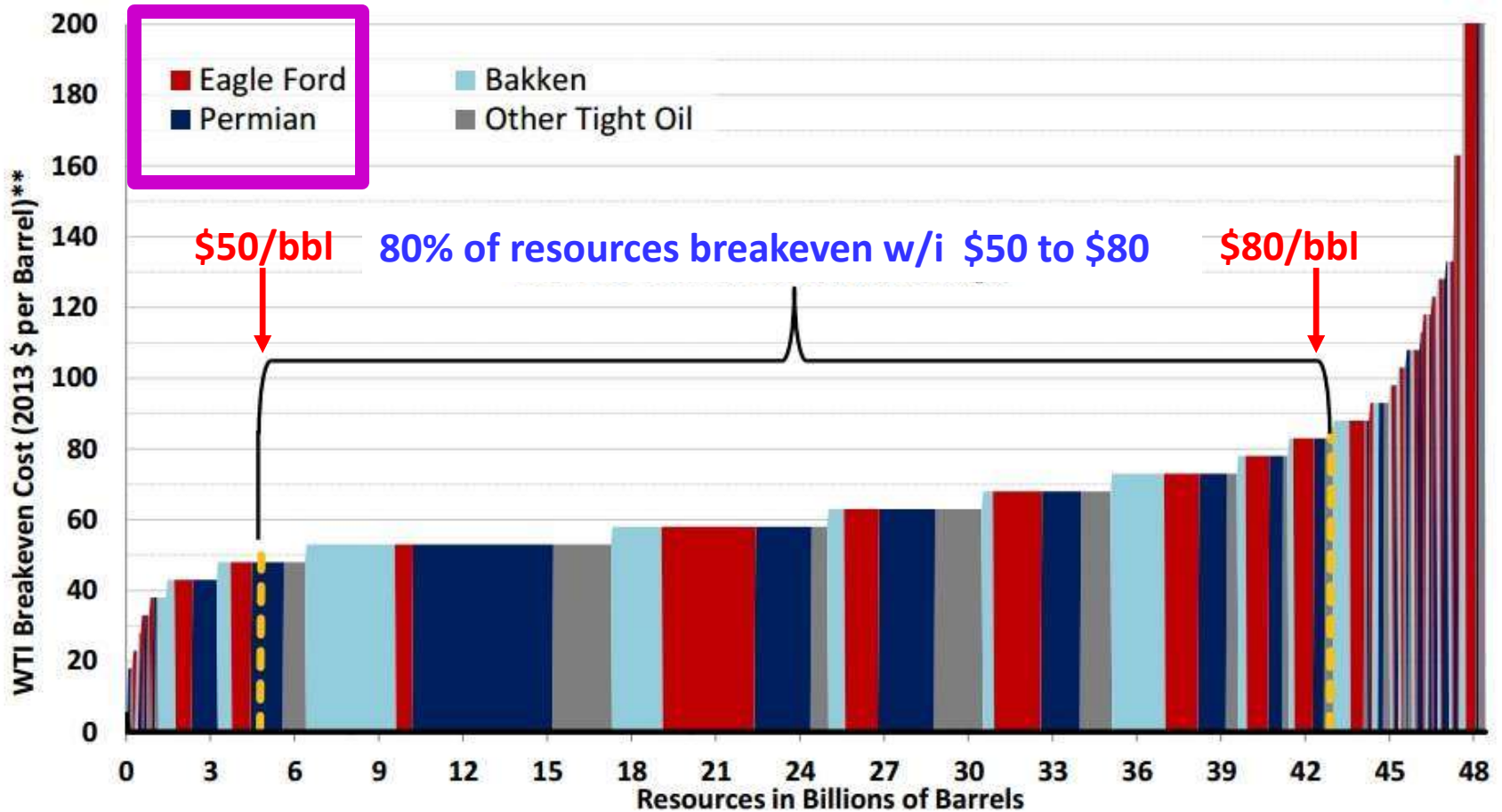
Red Dots Show Active Gas Rigs

(As of October 17th, 2014)



Source: Baker Hughes

U.S. Tight Oil Resources by Breakeven Cost



Most U.S. tight oil resources break even with WTI prices at \$50 - \$80/bbl

Source: Rystad Energy, excludes NGLs

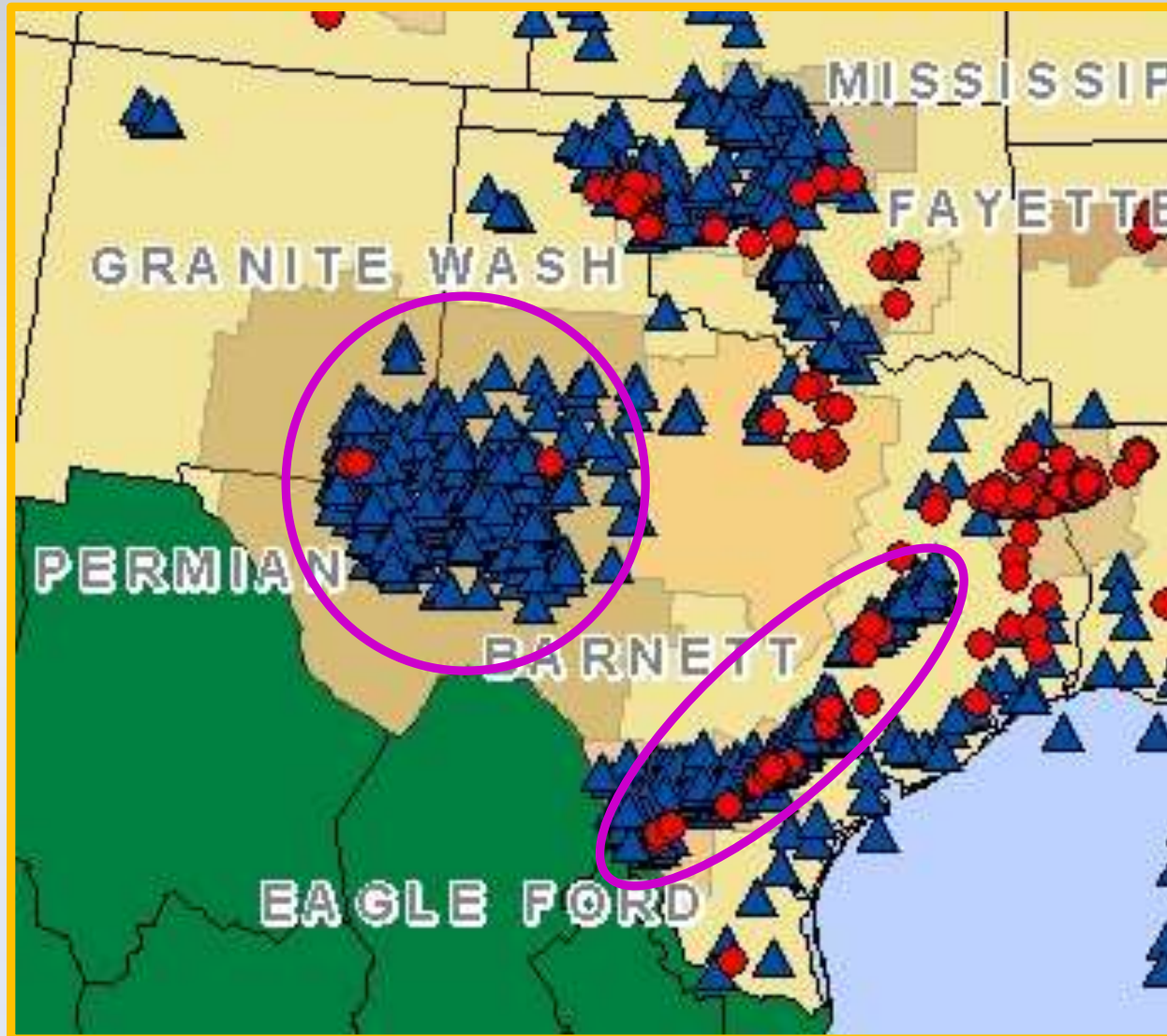
Source: Rystad Energy O&G Consultants

* Lower 48 proved, probable, possible and contingent resources; crude and condensate only; excludes existing production and undiscovered resources

** Breakeven includes 10% return, land acquisition costs of \$5/bbl were added across the board

Blue Triangles Show Active Oil Rigs

(As of October 17th, 2014)



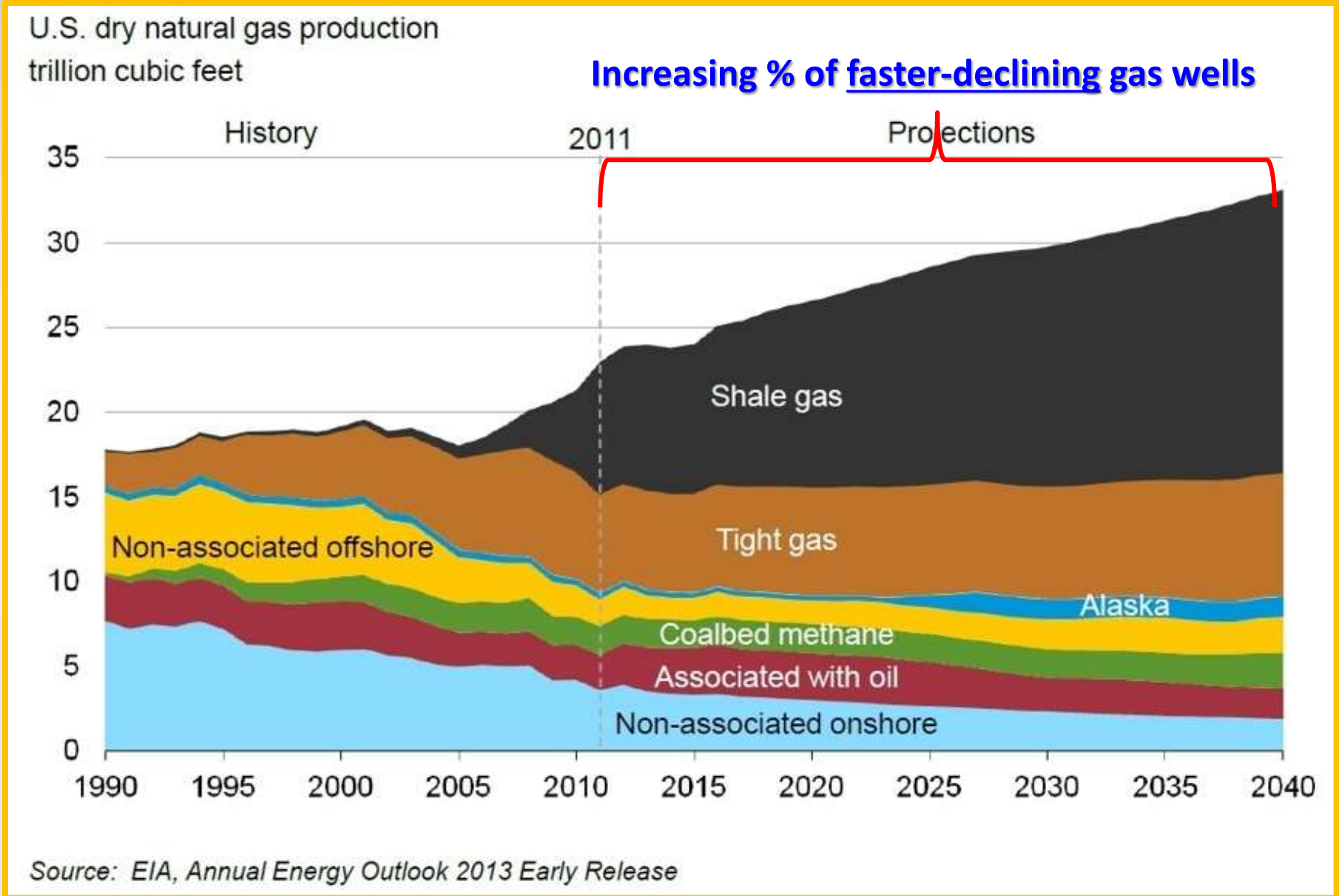
Source: Baker Hughes

Some of the Unknowns that Could Affect the Price of Oil & Gas

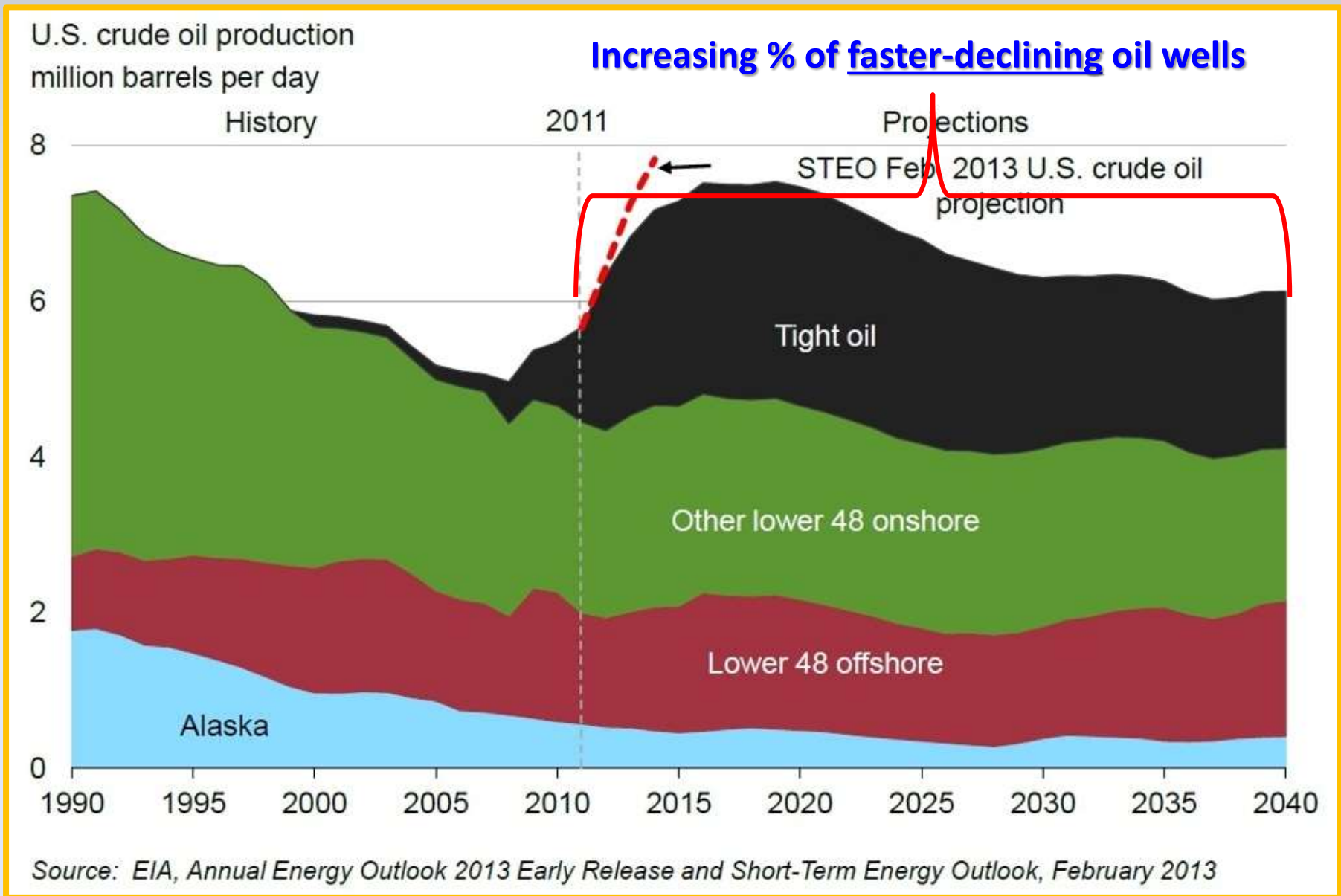
Unknowns that Could Affect Price

- 1) How fast will **technology** improve? (Remember natural gas)
 - Will technology further reduce **drilling costs**?
 - Will technology improve **recovery rates of O&G in place**?
 - Will technology slow **unconventional well decline rates**?

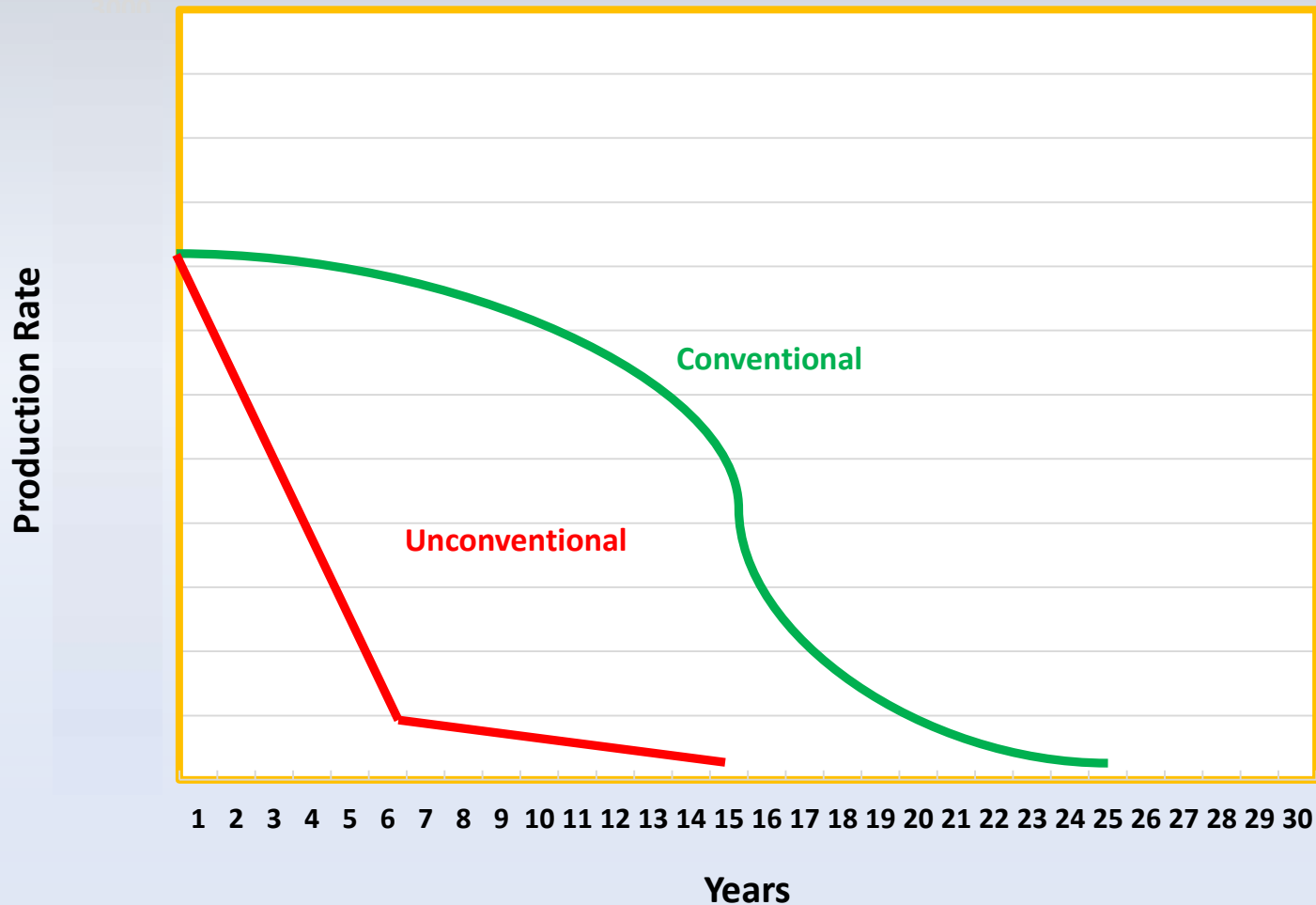
Pct. Of U.S. Unconventional Gas Wells Grow Over Time



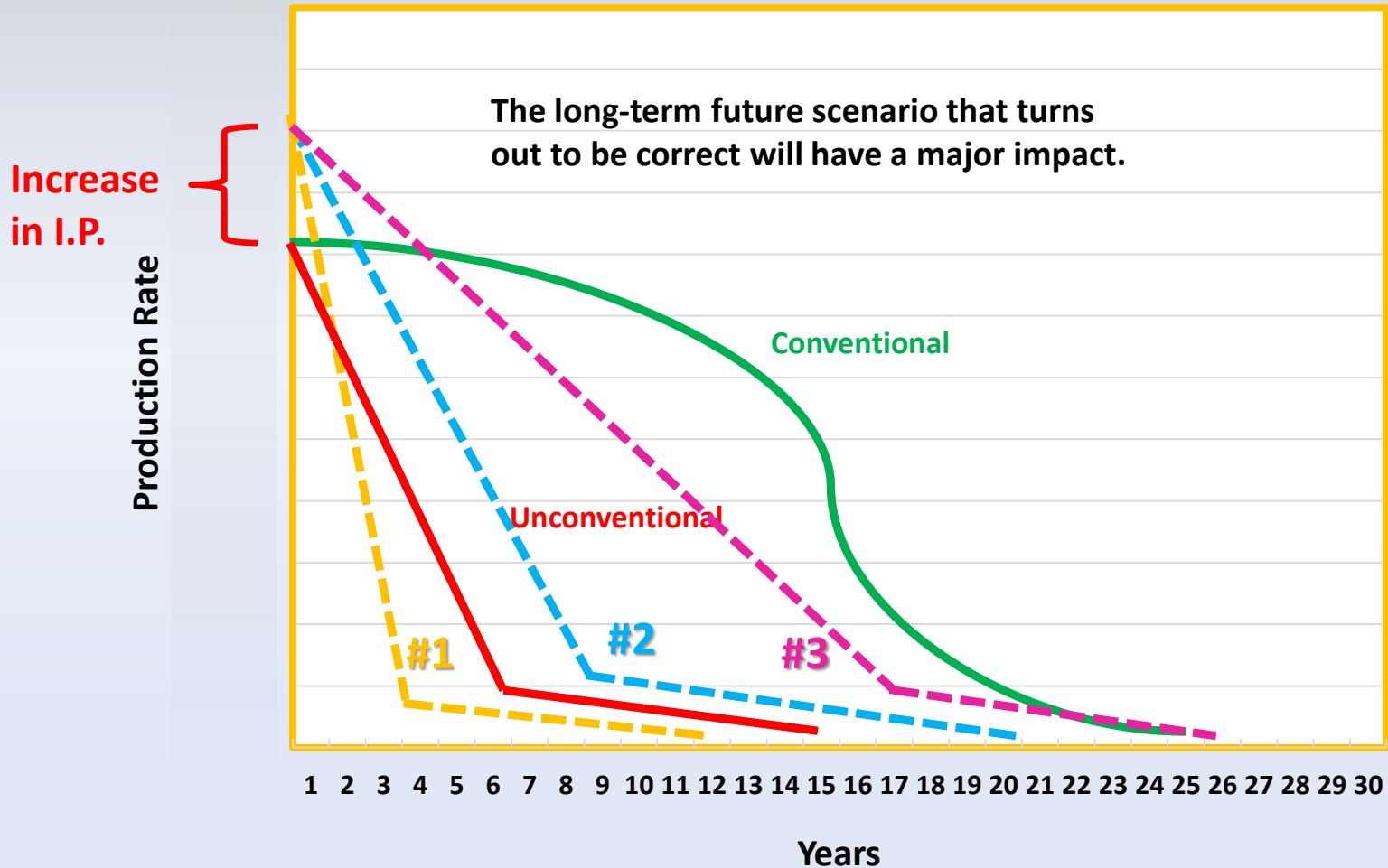
Pct. Of U.S. Unconventional Oil Wells Grow Over Time



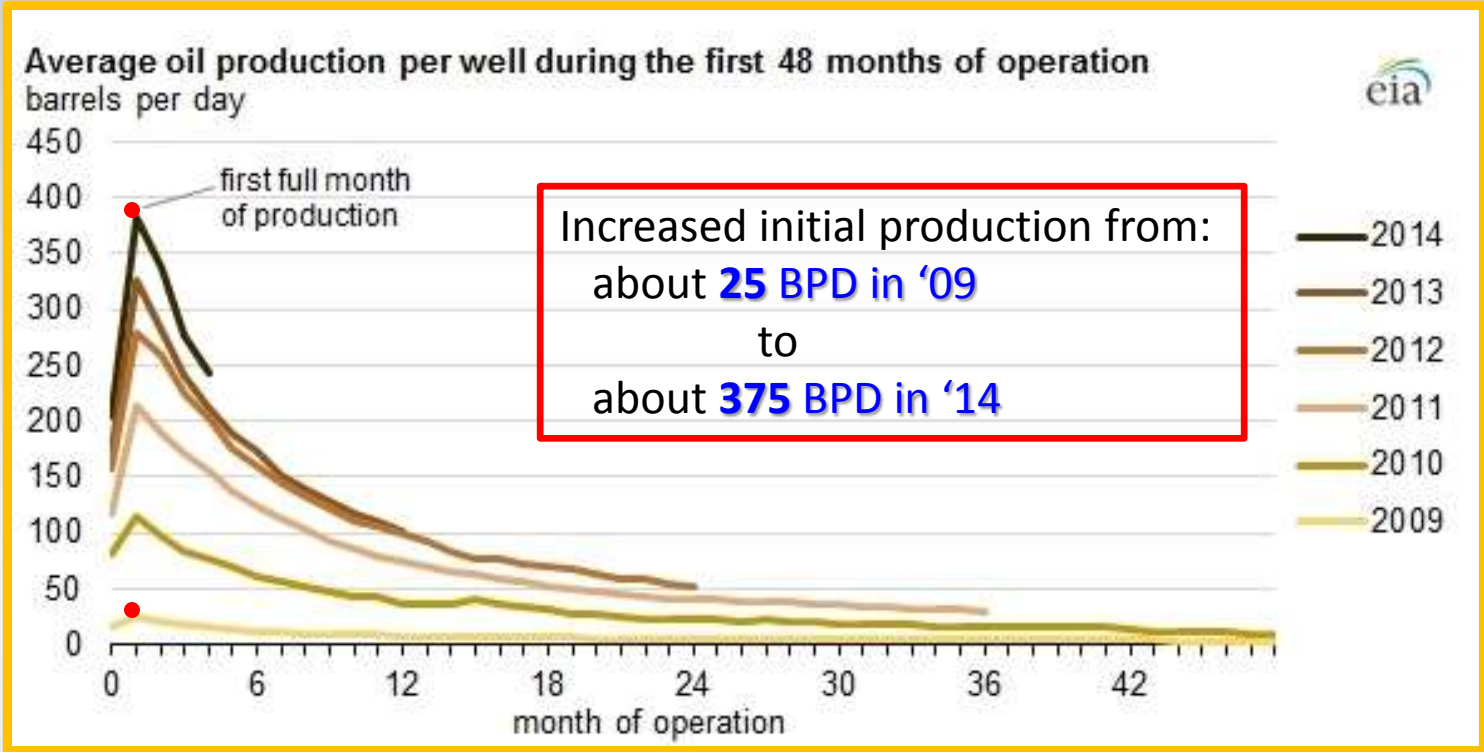
Unconventional vs Conventional O&G Well Lifetime Production Curves



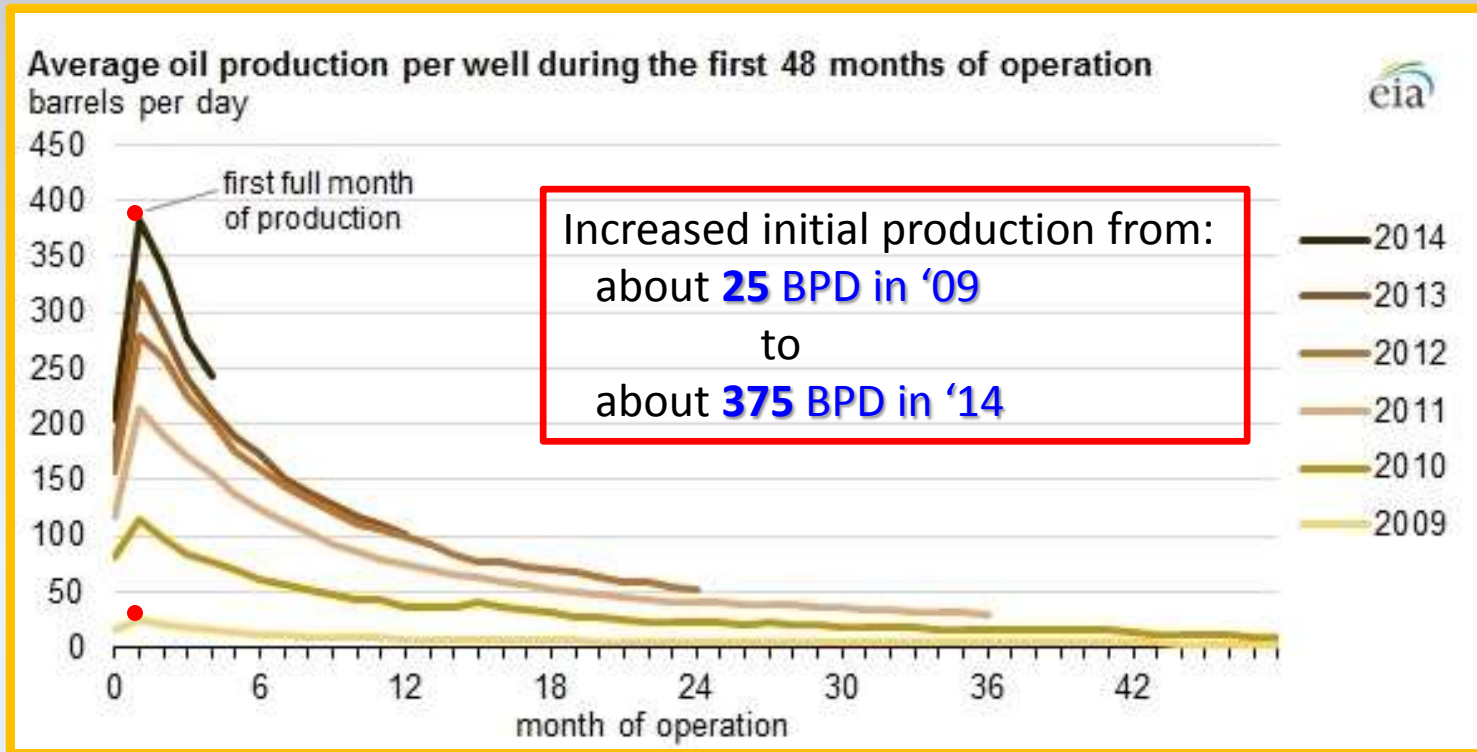
But What About Production Over the Total Life of a Well?



Eagle Ford Numbers Show Increased Initial Production



Numbers Also Show Increased Decline Rates



Year-over-year decline in production in wells drilled in the Eagle Ford region from 2009-13

	year 1	year 2	year 3	year 4
2009	-70%	-30%	-20%	-20%
2010	-68%	-39%	-28%	-42%
2011	-65%	-47%	-27%	
2012	-64%	-48%		
2013	-69%			

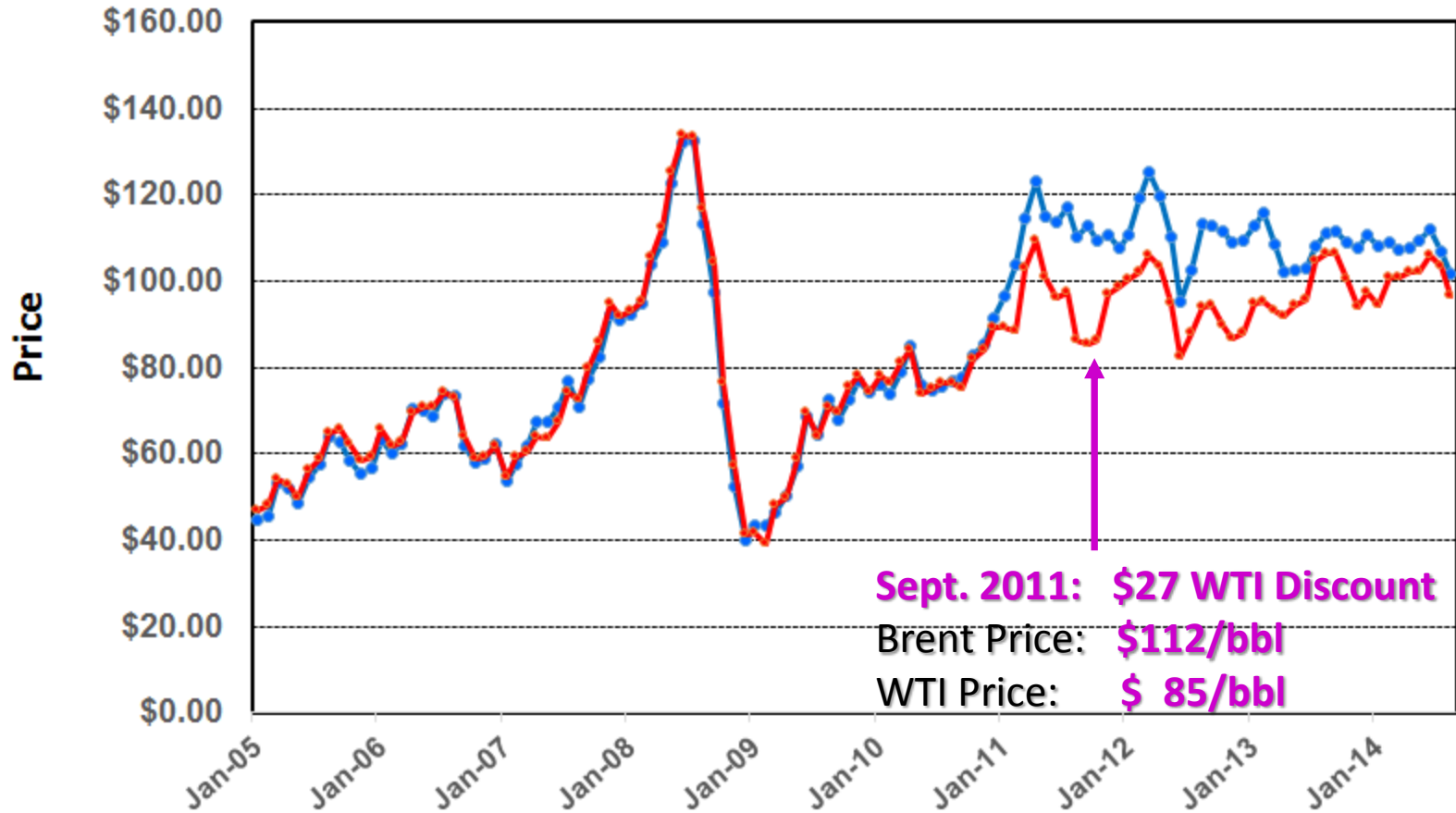
Source: Energy Information Administration

Unknowns that Could Affect Price

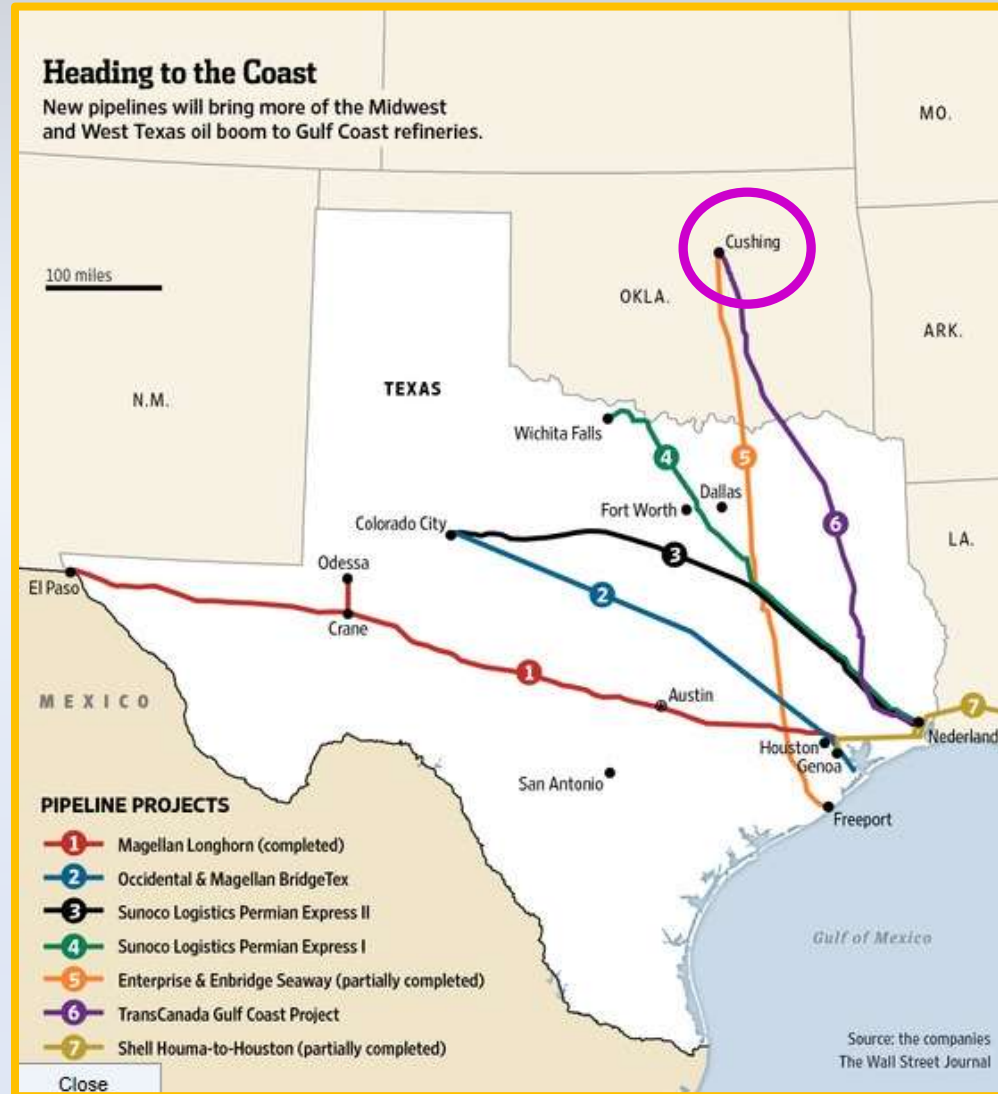
- 2) Will restrictions on **exporting U.S. crude** be lifted?
- Pits (midsize) **Refiners** against (independent) **Producers**
 - Recent reports say **crude exports would actually benefit U.S. economy**
(ex. **lower the price of gasoline**)
 - Federal **political fear** may override economic considerations until there is a “crisis” (i.e. a glut, causing prices to drop significantly)

If We Don't Export Crude, Are We Headed for Another Bottleneck Similar to 2011?

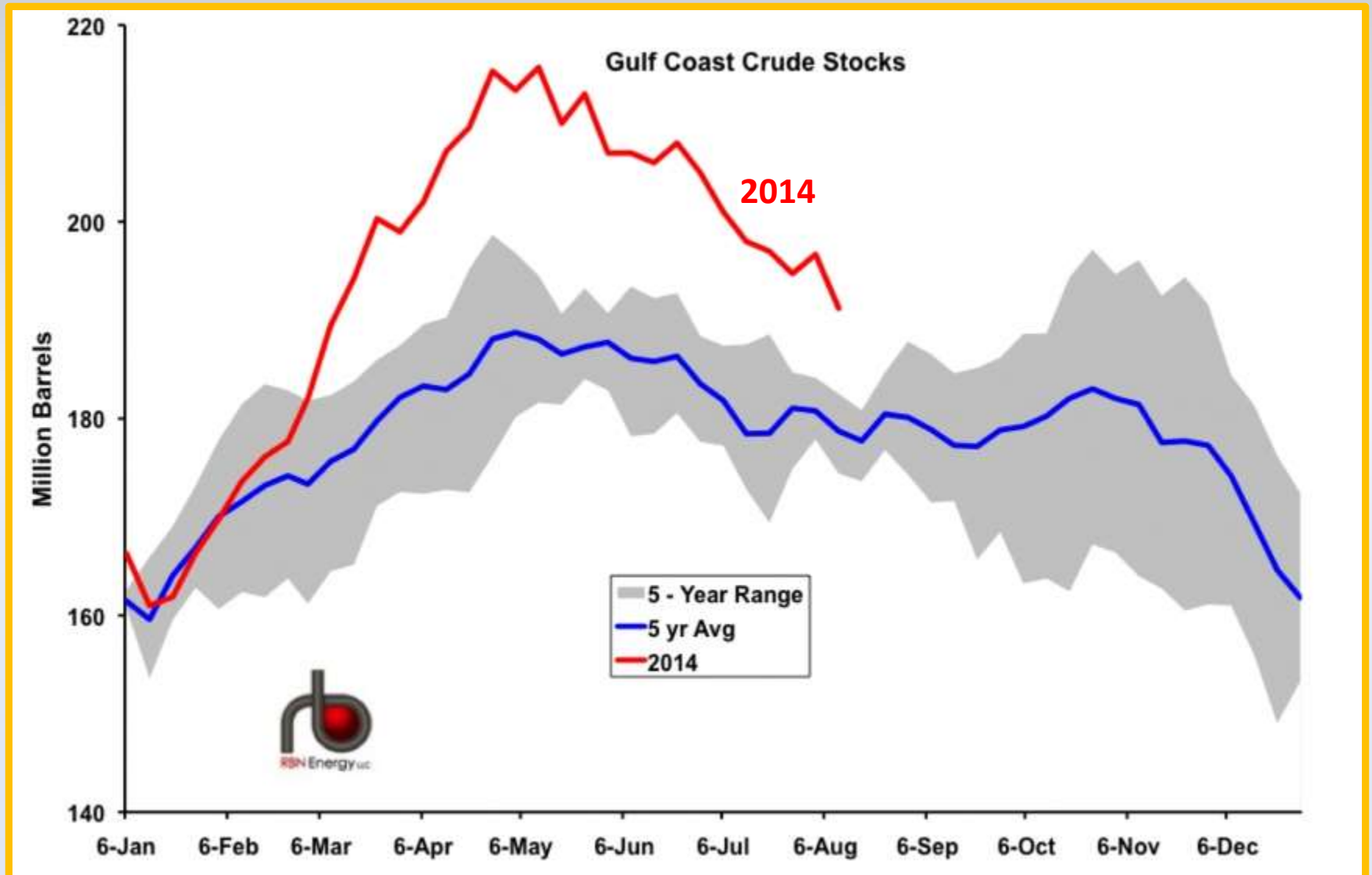
Brent and West TX Intermediate Crude Price
(Dollars per Barrel)



New Pipelines Have Pushed the Crude South to the Gulf Coast

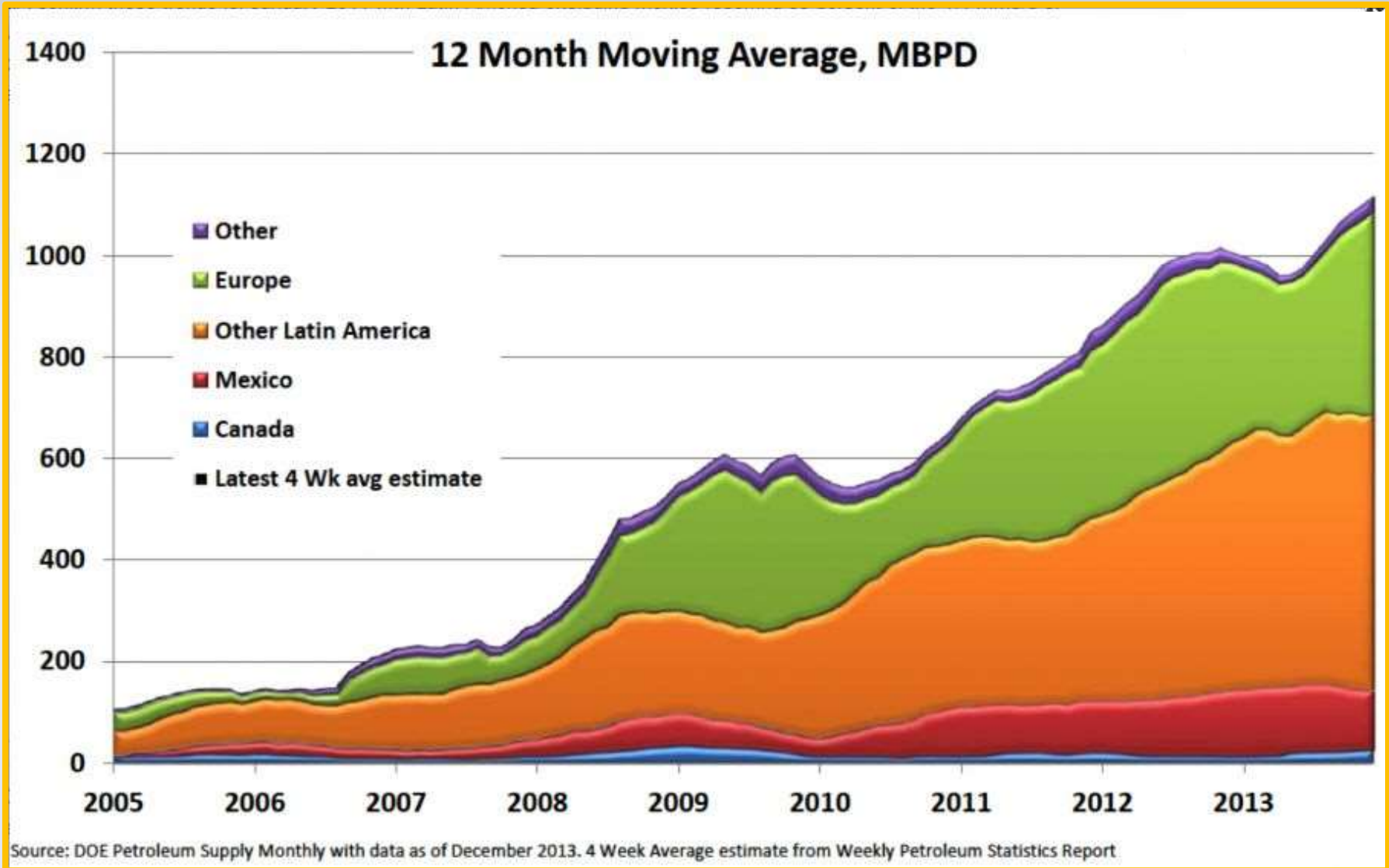


Now Gulf Coast Light Crude Inventories are Much Higher than Average

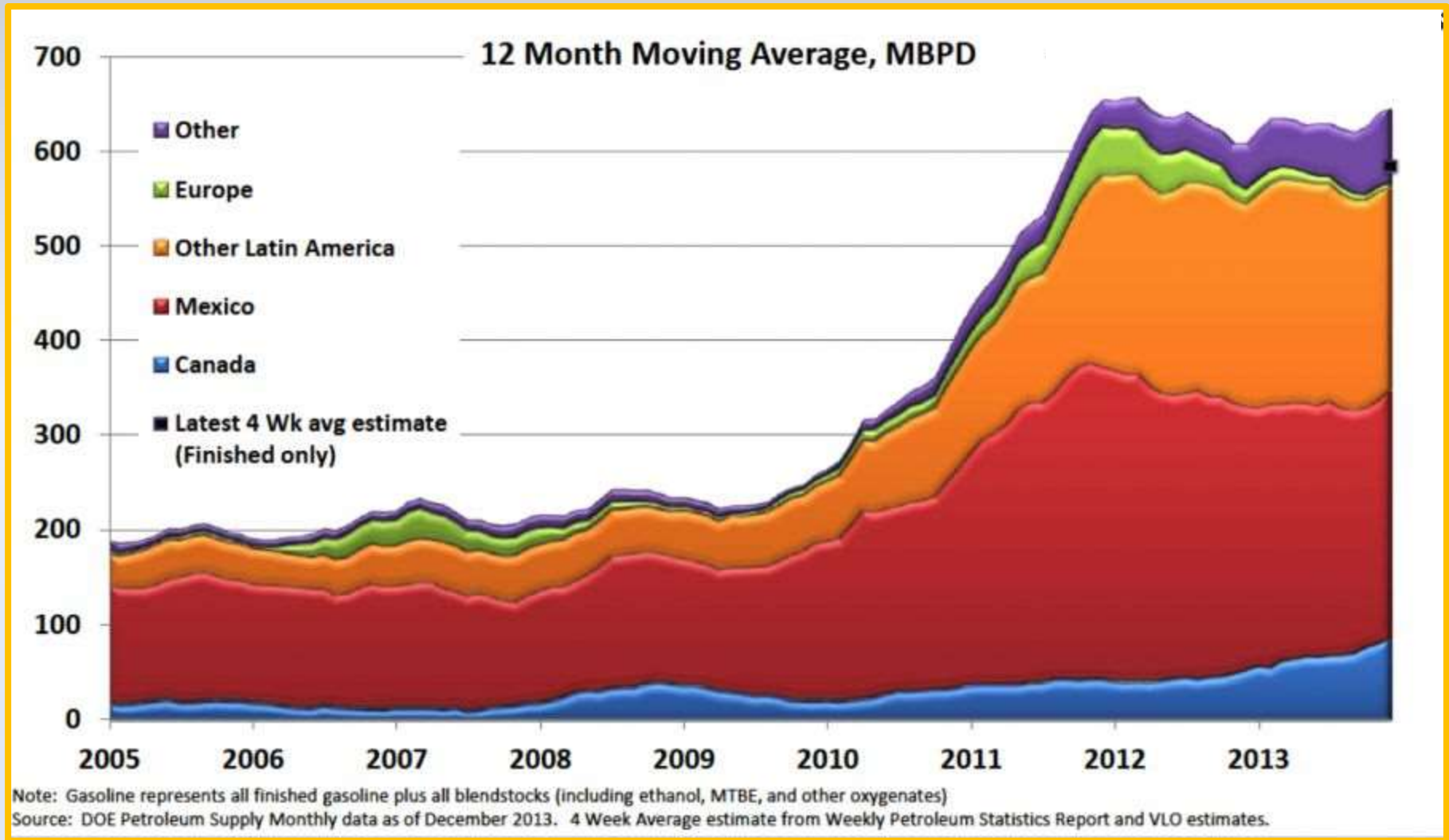


Source: RBN Energy Blog

In the Absence of Crude Exports: U.S. Diesel Exports Have Increased Dramatically



In the Absence of Crude Exports: The Same With U.S. Gasoline Exports



Unknowns that Could Affect Price

3) Will the major Gulf of Mexico refineries retool to refine **massive amounts of light U.S. crude**?

The short answer is: **NO** (So, a glut is not out of the question.)

Unknowns that Could Affect Price

Looking at Natural Gas

- 4) How much **LNG** will be exported from the US?
 - Pits **Petrochemicals, Manufacturing, Elect. power** against **Producers**
 - Some **Petrochemicals** showing more flexibility lately
(Dividing between those who use **dry gas** vs **NGLs** for their feedstocks)

DOE Has Approved LNG Export Terminals Totaling 9.5 BCF/day in Export Capacity

DOE Order of Processing	LNG Facility	Capacity	FERC Application Status	Non-FTA Application	Location
Completed	Sabine Pass Liquefaction	2.2 bcf/d	Approved	Approved	Gulf Coast
Completed	Freeport LNG Expansion	1.4 bcf/d	Filed	Approved	Gulf Coast
Completed	Lake Charles	2.0 bcf/d	NEPA Pre-filing	Approved	Gulf Coast
Completed	CovePoint	1.0 bcf/d	Filed	Approved	East Coast
Completed	Freeport LNG Expansion	0.4 bcf/d ¹	Filed	Approved	Gulf Coast
Completed	Cameron LNG	1.7 bcf/d	Filed	Approved	Gulf Coast
Completed	Jordan Cove	0.8 bcf/d ²	Filed	Approved	West Coast

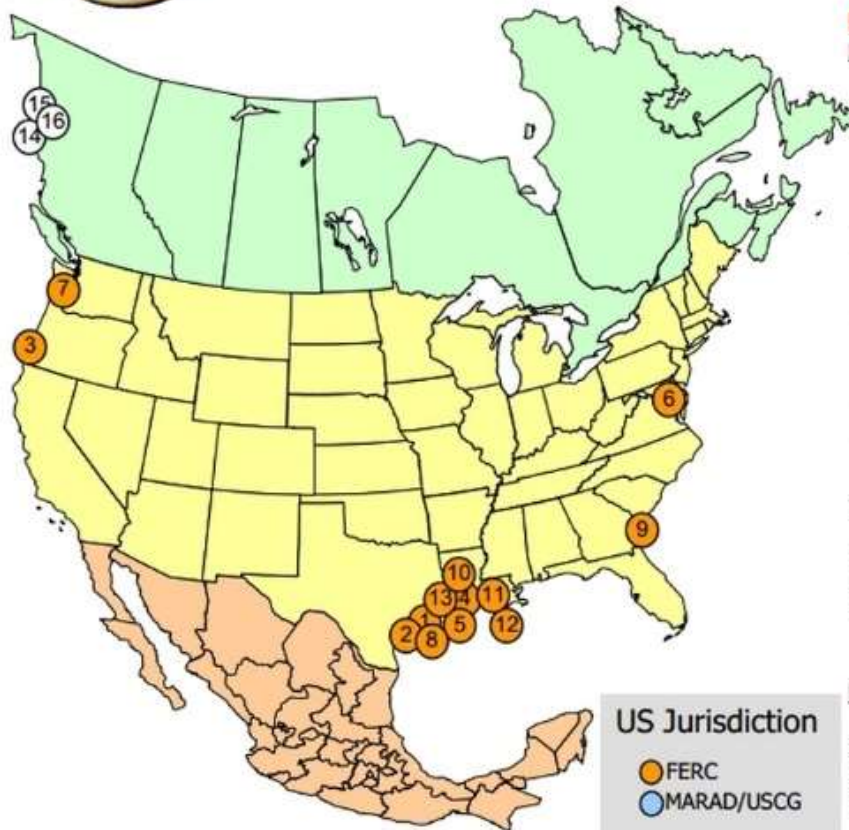
¹ Freeport requested 1.4 Bcf/d, but was only approved for 0.4 Bcf/d (consistent with FERC application capacity request)

² Jordan Cove Phase 1 capacity represents 6 mtpa of LNG at the outlet of the plant. Phase 2 expansion will increase outlet capacity to 9 mtpa

Other Proposed LNG Export Terminals Could Add Another 16 BCF/day in Exports



North American LNG Export Terminals *Proposed*



Export Terminal PROPOSED TO FERC

- 1. Freeport, TX:** 1.8 Bcfd (Freeport LNG Dev/Freeport LNG Expansion/FLNG Liquefaction) (CP12-509)
- 2. Corpus Christi, TX:** 2.1 Bcfd (Cheniere – Corpus Christi LNG) (CP12-507)
- 3. Coos Bay, OR:** 0.9 Bcfd (Jordan Cove Energy Project) (CP13-483)
- 4. Lake Charles, LA:** 2.2 Bcfd (Southern Union - Trunkline LNG) (CP14-120)
- 5. Hackberry, LA:** 1.7 Bcfd (Sempra – Cameron LNG) (CP13-25)
- 6. Cove Point, MD:** 0.82 Bcfd (Dominion – Cove Point LNG) (CP13-113)
- 7. Astoria, OR:** 1.25 Bcfd (Oregon LNG) (CP09-6)
- 8. Lavaca Bay, TX:** 1.38 Bcfd (Excelerate Liquefaction) (CP14-71 & 72)
- 9. Elba Island, GA:** 0.35 Bcfd (Southern LNG Company) (CP14-103)
- 10. Sabine Pass, LA:** 1.40 Bcfd (Sabine Pass Liquefaction) (CP13-552)
- 11. Lake Charles, LA:** 1.07 Bcfd (Magnolia LNG) (PF13-9)
- 12. Plaquemines Parish, LA:** 1.07 Bcfd (CE FLNG) (PF13-11)
- 13. Sabine Pass, TX:** 2.1 Bcfd (ExxonMobil – Golden Pass) (PF13-14)

PROPOSED CANADIAN SITES IDENTIFIED BY PROJECT SPONSORS

- 14. Kitimat, BC:** 1.28 Bcfd (Apache Canada Ltd.)
- 15. Douglas Island, BC:** 0.23 Bcfd (BC LNG Export Cooperative)
- 16. Kitimat, BC:** 3.23 Bcfd (LNG Canada)

As of March 26, 2014

* Filed Certificate Application

Office of Energy Projects

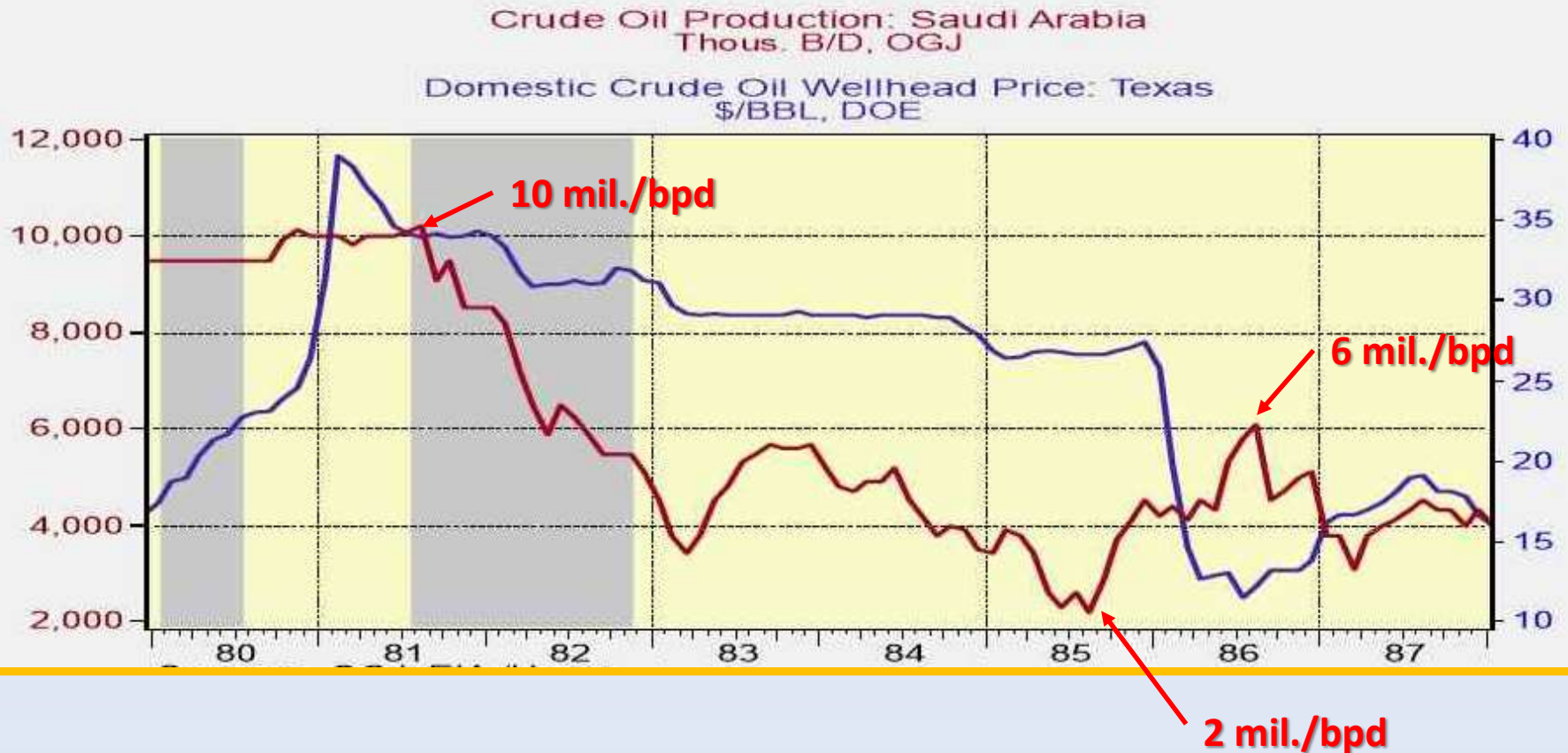
Unknowns that Could Affect Price

5) Could **geopolitical situation** in the Middle East (ex. Iran, Iraq, Libya) worsen again, increasing the chance that supply will be reduced?

Yes (But the opposite has actually been occurring)

How is this O&G boom different from the 80's?

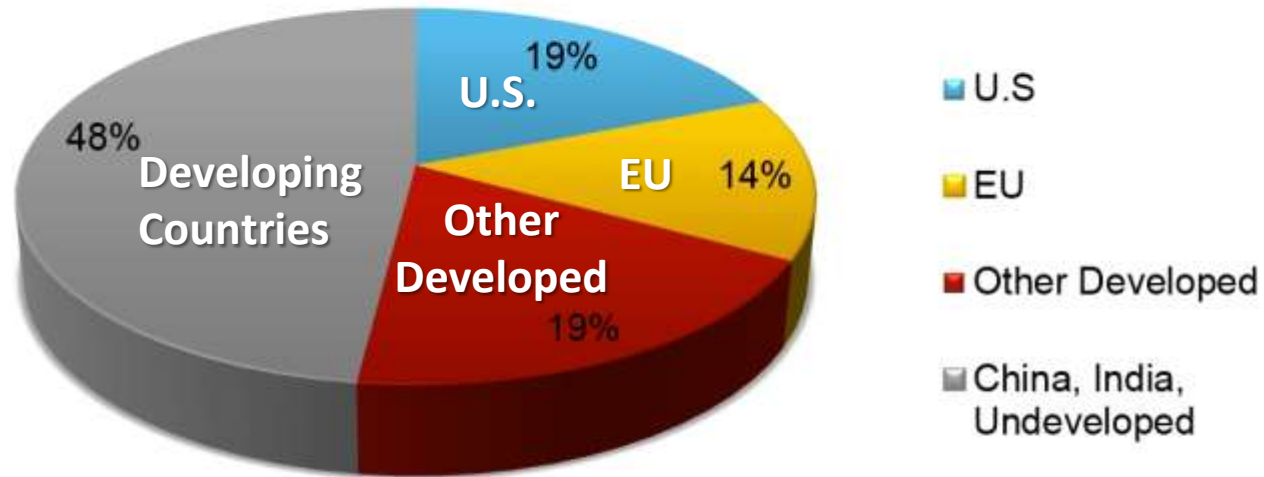
In Early 1980's, Saudis Cut Their Production as Other New Supplies Came On



Source: Haver Analytics

Today, Saudis Think **Developing Countries** Will Drive Future Oil Consumption

Oil Consumption - 2010



U.S – 12 Barrels per Person per Year (300MM People)
China – 2 Barrels per Person (1,344MM People)

If people in China use 3 Barrels per person we need to cut our consumption by 4 Barrels per person to stay even on demand.

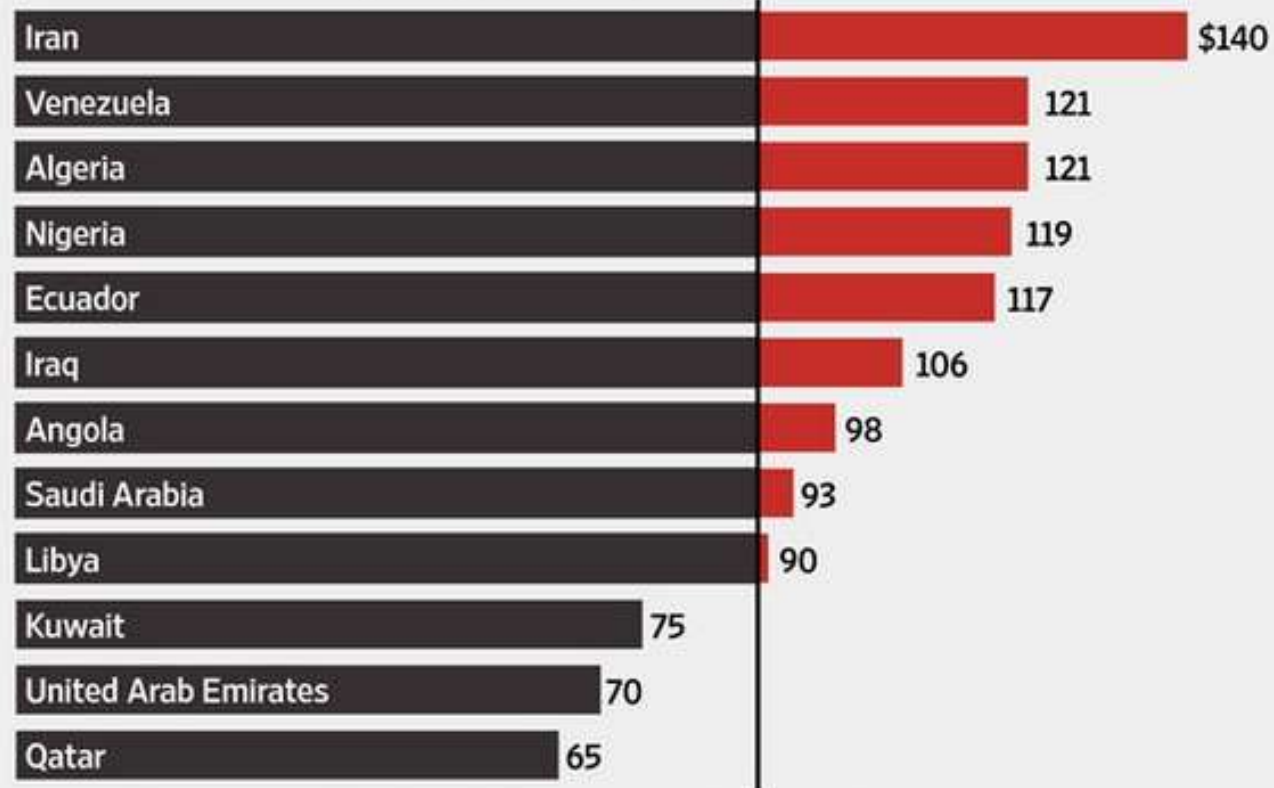
Alternative Energy and more efficient consumption required

Today, Most OPEC Countries Rely on Oil for Their Budgets (a lot)

OPEC's Price Crunch

Estimated breakeven oil price for 2014 government budgets

Oct. 10 Brent Crude Price: \$89



Sources: Libyan government; Angolan ministry of finance; International Monetary Fund; Arab Petroleum Investments Corp; Deutsche Bank
The Wall Street Journal

Russia Also Needs High Oil Price for Budgets

Largest Oil Companies

Oil Company	Production, 2012 or latest, m b/d*	Production, 2007, m b/d**	Reserves, 2010 or latest, billion barrels*	Reserves, 2007** billion barrels	
Saudi Arabia → Saudi Aramco	12.7	10.4	307	264.2	
Russia → Gazprom (Russia)	8.4		112		
Iran → NIOC (Iran)	6.1	4.4	311	138.4	
	ExxonMobil	4.1	2.62	25	11.07
China → PetroChina (CNPC)	3.6	2.76	23	22.45	
Kuwait → Kuwait Petroleum	3.3	2.6	112	101.5	
	Shell	3.3	1.9	8	4.89
Mexico → Pemex	3.2	3.5	11	12.19	
	BP	3.0	2.4	7	10.07
	Chevron	2.9	1.78	9	7.52

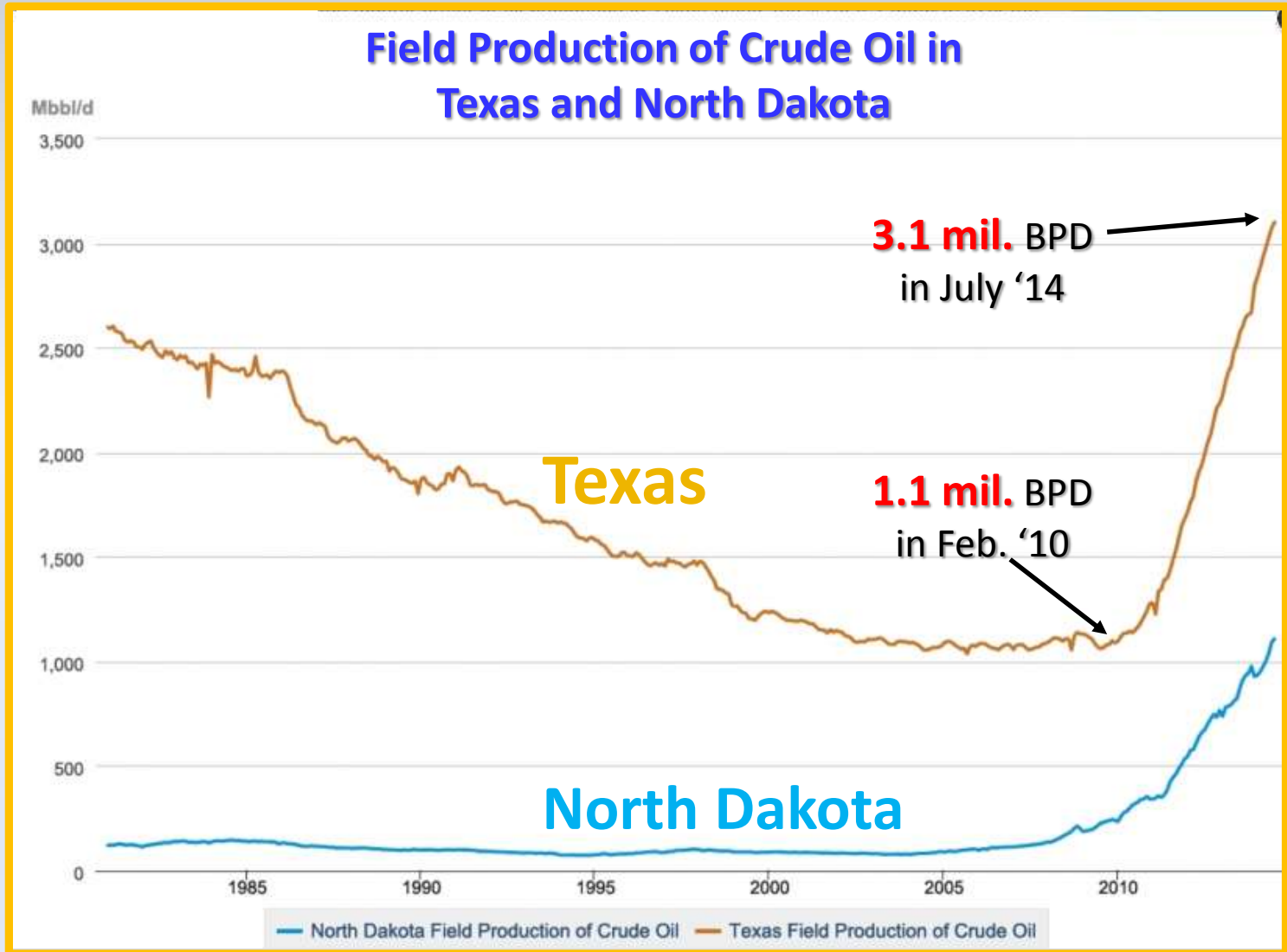
* Oil equivalent, from The Economist, Aug 3, 2013

**Petroleum Intelligence Weekly, Dec 2008, re-published in Journal of Economic Perspectives

© Jennifer Warren 2013

Breakeven Oil Price Source: April 11, 2014 Bloomberg article: "Venezuela Needs 2014 Brent Oil Price of \$121"

Meanwhile, **Texas** Crude Production is Soaring



Source: U.S. Energy Information Administration

What Lies Ahead?

Who (if anyone) Cuts Production?

(and how could that affect U.S. unconventional drilling?)

- **Russia** and **most OPEC countries** besides the Saudis can't.
- **Saudis** have argued that the U.S. and Canada are the “high-cost” producers and should cut before they do.
 - (Shale production should be the “**global stabilizer**” against high or low prices.)
- **U.S. producers** think Saudis will cut first.
 - Does it benefit the Saudis if the U.S. gets thrown into **recession**?
 - (Also don't forget shale producers are on a **drilling treadmill** and don't want it to stop.)

Who (if anyone) Cuts Production?

(and how could that affect U.S. unconventional drilling?)

- **Saudis** would seem to be in the “driver’s seat.”
 - Have staying power of **\$700 bil. reserve fund.**
 - Say they are “comfortable” with oil dropping to \$80/bbl.
 - I believe they can dampen prices further if they want to.
- If you buy that, what are they thinking?
 - 1) Do they simply want increased **market share in Asia?** (minimal negative effect)
 - 2) Are they trying to get **other OPEC** members to cut? (minimal negative effect)
 - 3) Are they “*working with the U.S.*” to hurt **Russia and/or Iran?** (minimal negative effect)
 - 4) Do they see **U.S. shale** as a threat and want to stop it? (significant negative effect)
(OPEC meets on Thanksgiving Day)

Opinions on U.S. Breakeven Prices

(How big a threat are lower prices to O&G activity?)

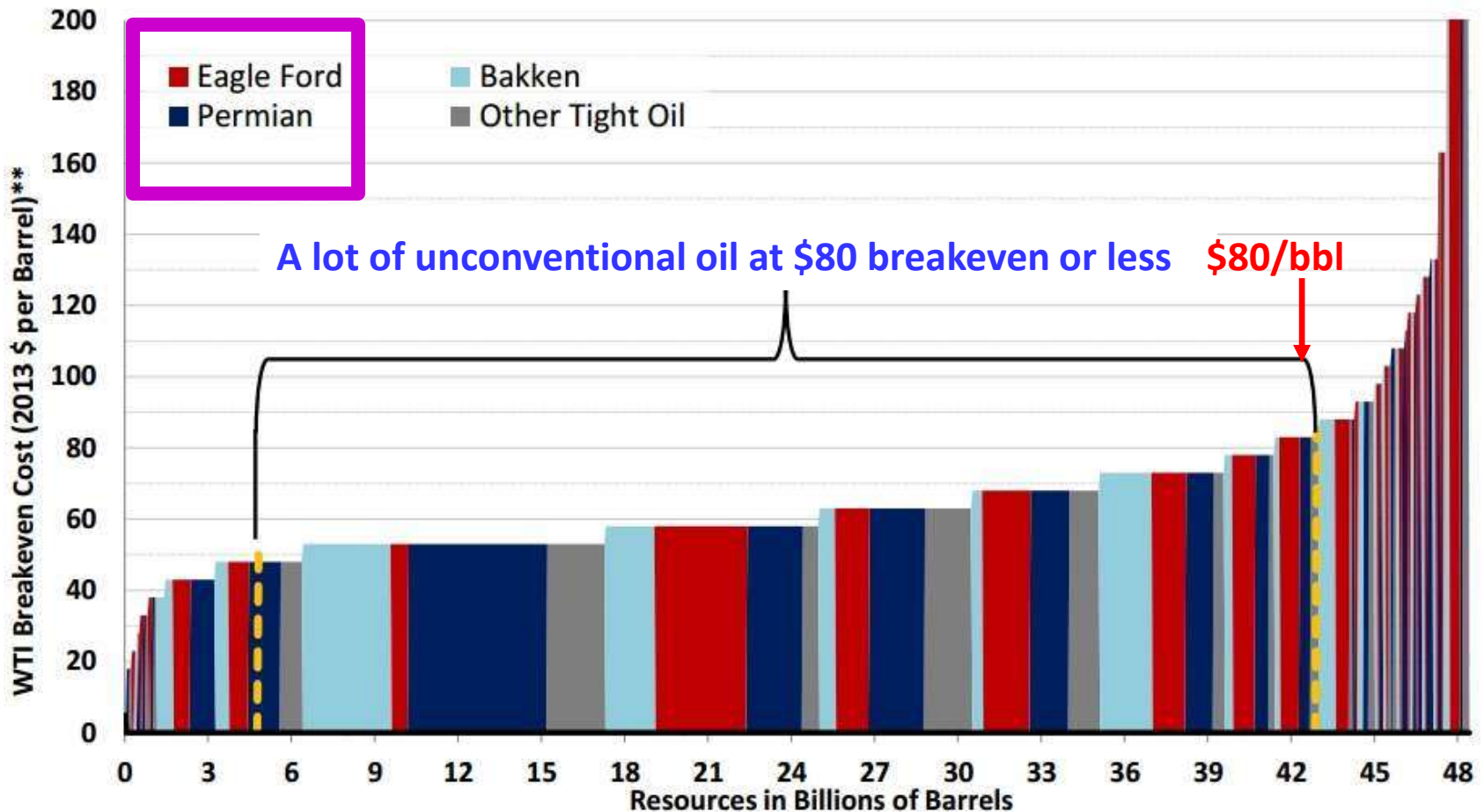
Halliburton's (HAL) CEO Dave Lesar On Q3 2014 Results - Earnings Call Transcript

Oct. 20, 2014 4:55 PM ET | About Halliburton Company (HAL)

"Nevertheless, we are keenly aware that there is a risk of a moderation in activity if oil prices remain weak for an extended period of time. What I can tell you is that in recent conversations with our North America customers, we have not received any indication of activity levels slowing as we transition into 2015.

For example, last week the IEA commented that approximately 98% of North America liquids projects have a breakeven price below \$80 per barrel and over 80% work below \$60 a barrel."

U.S. Tight Oil Resources by Breakeven Cost



Most U.S. tight oil resources break even with WTI prices at \$50 - \$80/bbl

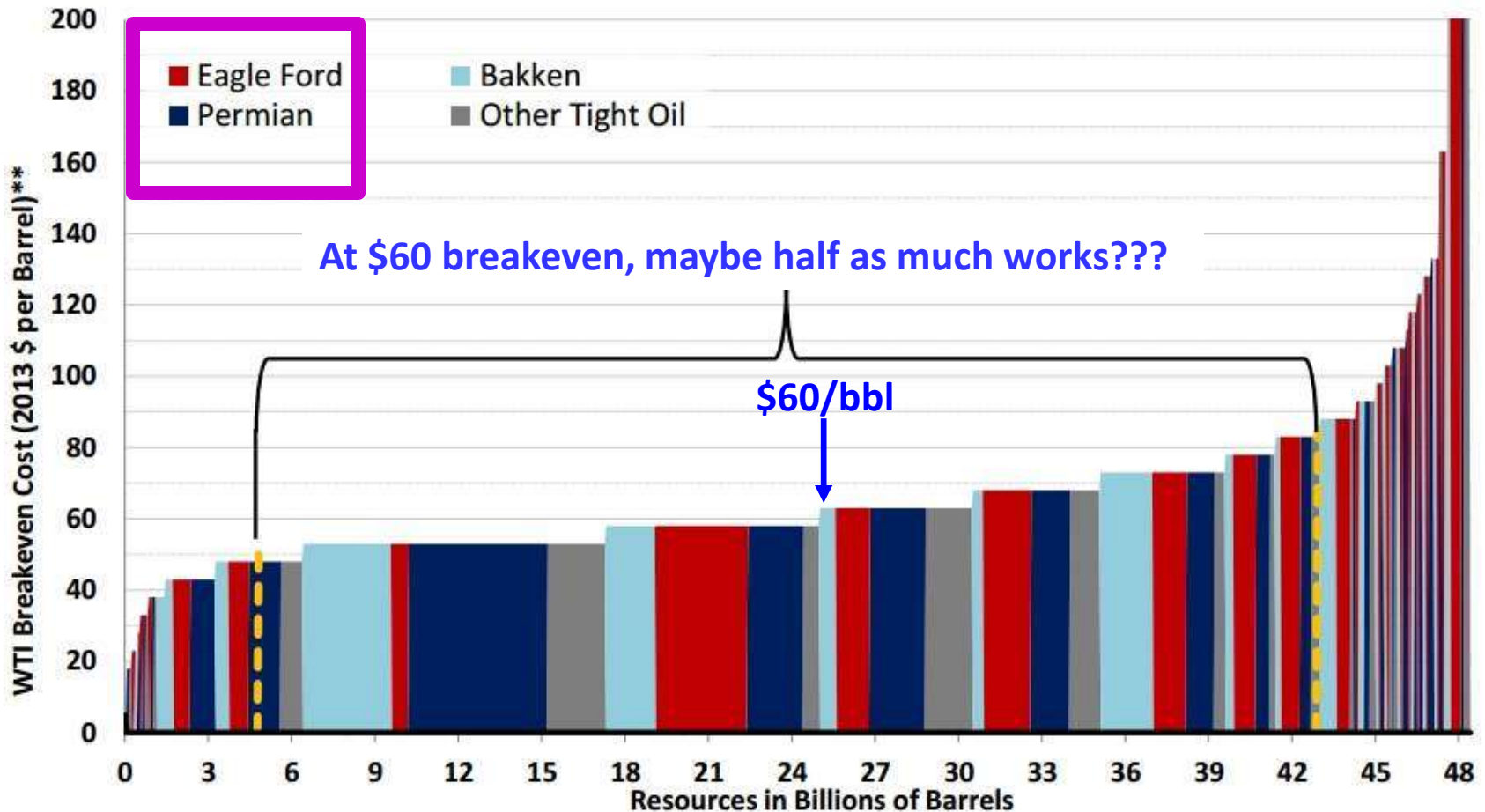
Source: Rystad Energy, excludes NGLs

Source: Rystad Energy O&G Consultants

* Lower 48 proved, probable, possible and contingent resources; crude and condensate only; excludes existing production and undiscovered resources

** Breakeven includes 10% return, land acquisition costs of \$5/bbl were added across the board

U.S. Tight Oil Resources by Breakeven Cost



Most U.S. tight oil resources break even with WTI prices at \$50 - \$80/bbl

Source: Rystad Energy, excludes NGLs

Source: Rystad Energy O&G Consultants

* Lower 48 proved, probable, possible and contingent resources; crude and condensate only; excludes existing production and undiscovered resources

** Breakeven includes 10% return, land acquisition costs of \$5/bbl were added across the board

Opinions on U.S. Breakeven Prices

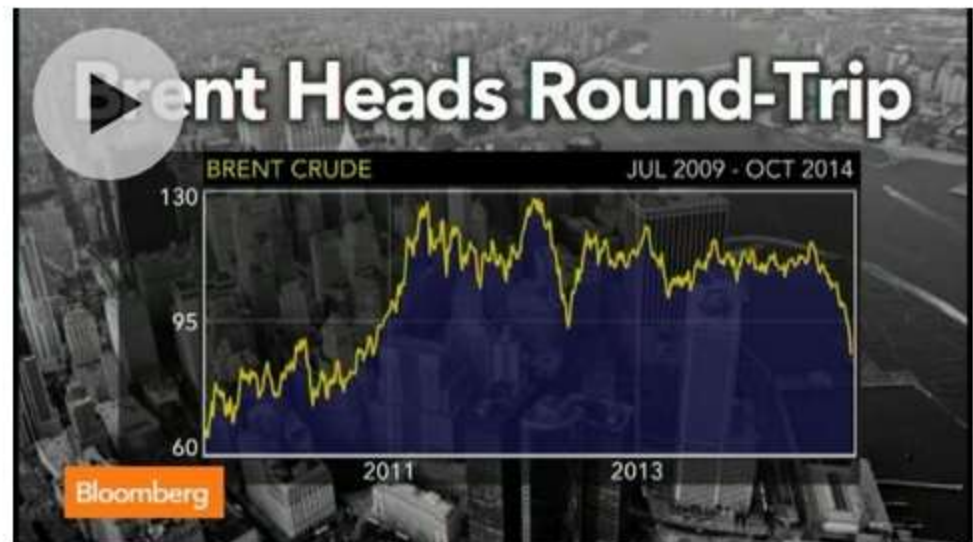
(How big a threat are lower prices to O&G activity?)

Oil at \$80 a Barrel Muffles Forecasts for U.S. Shale Boom

By Isaac Arnsdorf and Bradley Olson | Oct 21, 2014 6:03 AM CT | [175 Comments](#) [Email](#) [Print](#)

The **bear market** in oil has analysts reassessing the U.S. shale boom after five years of historic growth.

The U.S. benchmark price dropped to \$79.78 a barrel on Oct. 16, the lowest since June 2012. At that level, one-third of U.S. shale oil production would be uneconomic, analysts for New York-based Sanford C. Bernstein & Co. led by Bob Brackett said in a report yesterday. Drillers would add fewer barrels to domestic output than the previous year for the first time since 2010, according to Macquarie Group Ltd., ITG Investment Research and PKVerleger LLC.



Oct. 21 (Bloomberg) – Michael Levi, senior fellow at Council on Foreign Relations, discusses what the plunge in oil prices may mean to U.S. production. He speaks on "Bloomberg Surveillance." (Source: Bloomberg)

Conclusions

- If price of crude drops much below \$80/bbl for several months, we will get to see what “*actual breakeven*” is for some U.S. shale producers.
- Don’t forget the chance of unpredictable external shocks. (ex. A wider Middle East conflict; Iran comes off sanctions; a global recession; a strengthening dollar)
- Investor reaction to lower crude prices will be an important determinant of which producers continue on.
 - Most efficient operators in sweetest spots who have low leverage will do the best.
(But *how many* are there? Do *employees* and *leases* of the non-survivors get picked up?)

REAL ESTATE CENTER

**at TEXAS A&M UNIVERSITY
Mays School of Business**

<http://recenter.tamu.edu>