

Aging US Shale Wells: Years of Remaining Opportunities or Growing Asset Retirement Obligations?

Laura Freeman

AAPG Women's Network Luncheon
IMAGE 2022



Speaker



Laura Freeman is the founder and CEO of Highpoint Global Capital. She has been an integral part of over \$5 billion in acquisitions and divestitures including the high-profile acquisition of all of Hunt Oil Company's Permian Basin Assets in 2021. Laura specializes in technical valuation, financing, and navigating the complexities of dealmaking. She has worked various high tech and ESG projects for clients including \$100 million in funding for wind royalties, bitcoin applications for waste gas, ESG planning, and technology use and integration.



Laura has a Master's in Petroleum Engineering, an MBA from UCLA Anderson, and a bachelor's degree in Physics. She has been featured as an expert on M&A, finance, and Reservoir Engineering for various magazines, industry events, and online publications including Oil and Gas Financial Journal, Society of Petroleum Engineers (SPE), OilPrice.com, PHDWin week, American Association of Petroleum Geologists (AAPG), and Journal of Petroleum Technology (JPT).

Highpoint Activity



Founded Highpoint Global Capital over 5 years ago

Highpoint is a technically focused advisory firm

Faced and challenged many of the largest banks, Private Equity firms, and largest Oil and Gas companies and have won deals

Transacted even during down-turns and Covid years

Highlights:

- Transacted several deals over \$20MM
- \$100MM in funding for a client doing ESG work
- Hunt Permian deal for Vencer/Vitol

Exciting current projects:

- Portfolio management and divestiture timing work
- Navajo Nation Oil and Gas

Warning – not a geology talk!

So why are you here?

There is a lot of frustration by technical experts at investment decisions

- The M&A viewpoint is often not the same as the technical expert viewpoint
- The banker or PE view is often (almost always?) not the technical view
- Poor decision making without sufficient subsurface and technical understanding led to the destruction of billion of dollars

In my opinion the industry has lost it's way by deviating from sound technical understanding and decision making through the "shale boom"

There are a lot of muddy waters around investment decisions – acquisitions and drilling

There is high value add for careers, companies, and the industry as a whole when geologists and geoscientists learn more about cross-disciplinary implications and financial decision making

Low-Rate Wells Background



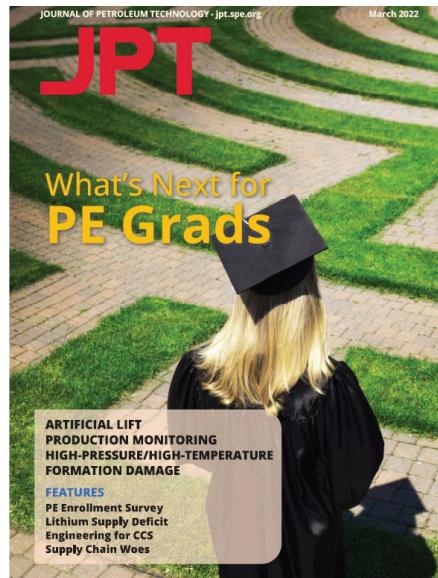
Buy-side clients looking to acquire conventional assets with "no stripper wells" - oil wells under 15 bopd and gas wells under 90 Mcfpd over 12 months

Journal of Petroleum Technology (JPT) editorials Feb 2021 and Feb 2022

Folks knew there were a lot of stripper wells but many were shocked at how many

Premise seems simple but there are deep implications especially within the M&A context

With an estimated 760,000 stripper wells in the US there is a large P&A or Abandonment, Decommissioning and Restoration (ADR) or Asset Retirement Obligation (ARO) liability that will have to be dealt with at some point

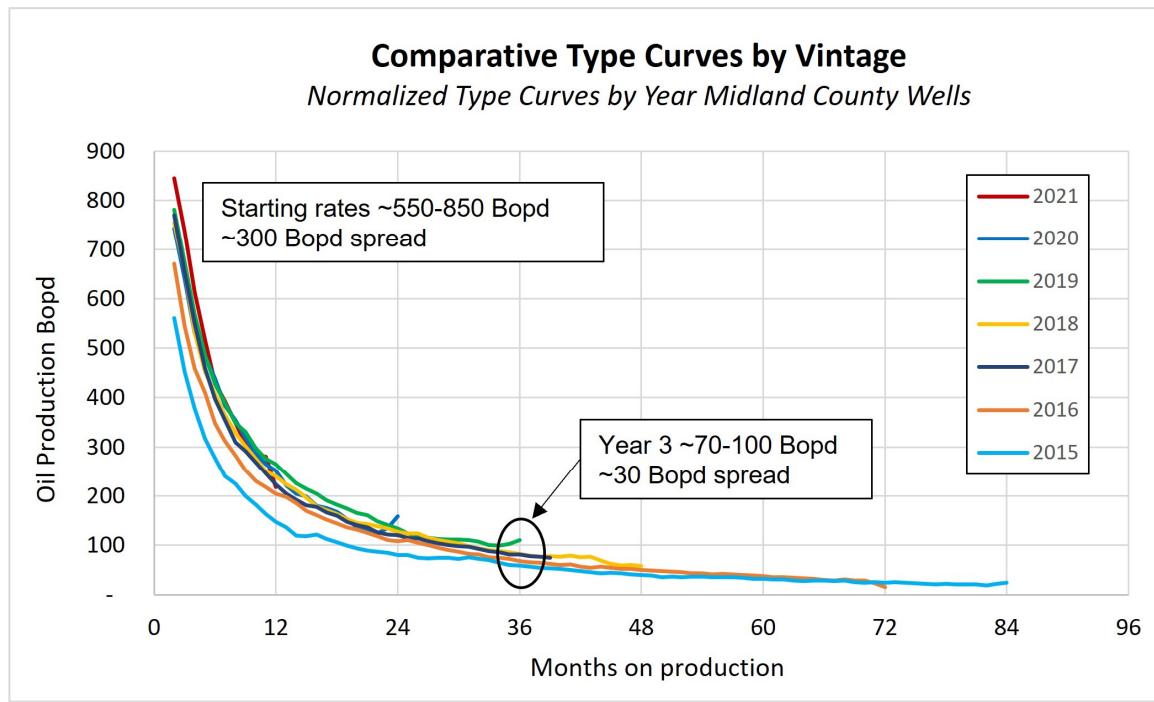


There have been some very muddy waters on unconventional well performance over the several years – and there has been massive capital destruction

High Drama



*Shown on
linear scale to
highlight the
rate changes*



"I think it misleads the investment community into believing that oil and gas experts are idiots"

"Your own statements adequately demonstrate your lack of knowledge concerning decline curve analysis, reservoir engineering, and current shale well economics."

"I have studied these type of examples and can tell you why this analysis is misleading and has no bearing on practical resource development. Please reach out if you would like more information and how to clean up this analysis"

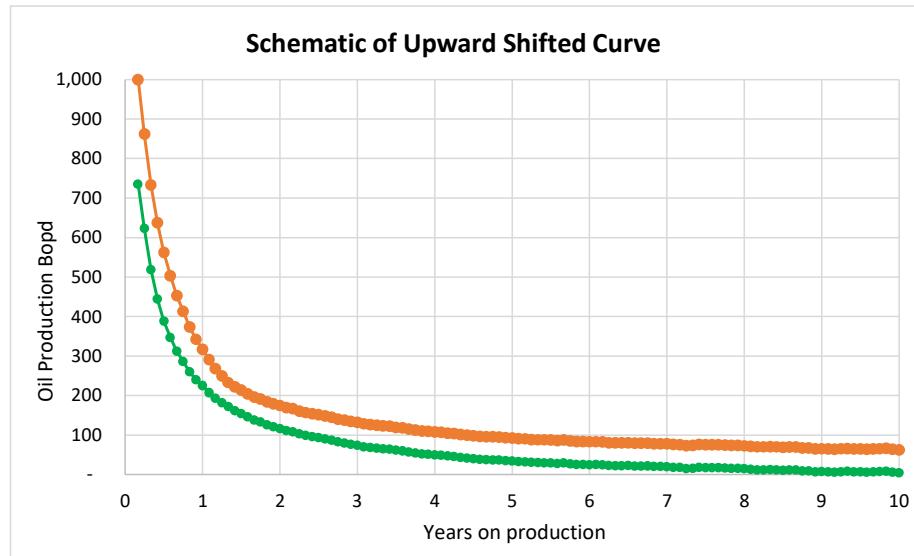
"Regarding your focus on and romance with ESG investing, you clearly do not understand where the world's energy comes from"

Forecasts



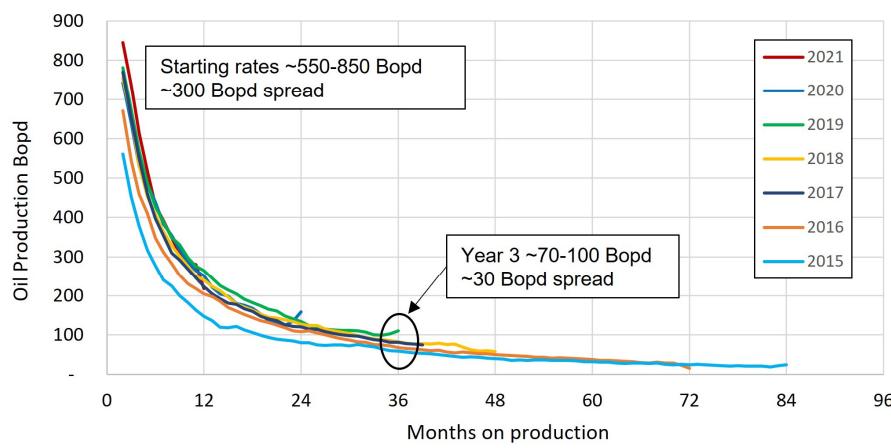
Higher IPs have not generally translated to an upward phase shift in matrix flow or longer fracture flow

Conceptual schematic only



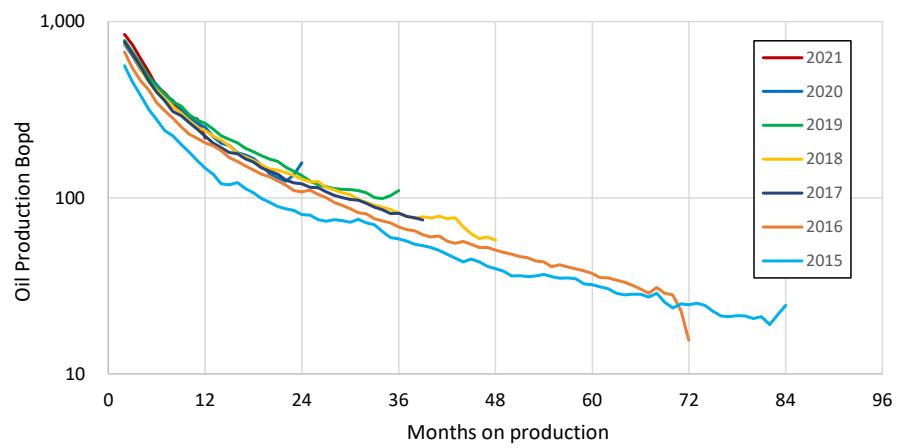
Linear

Comparative Type Curves by Vintage
Normalized Type Curves by Year Midland County Wells

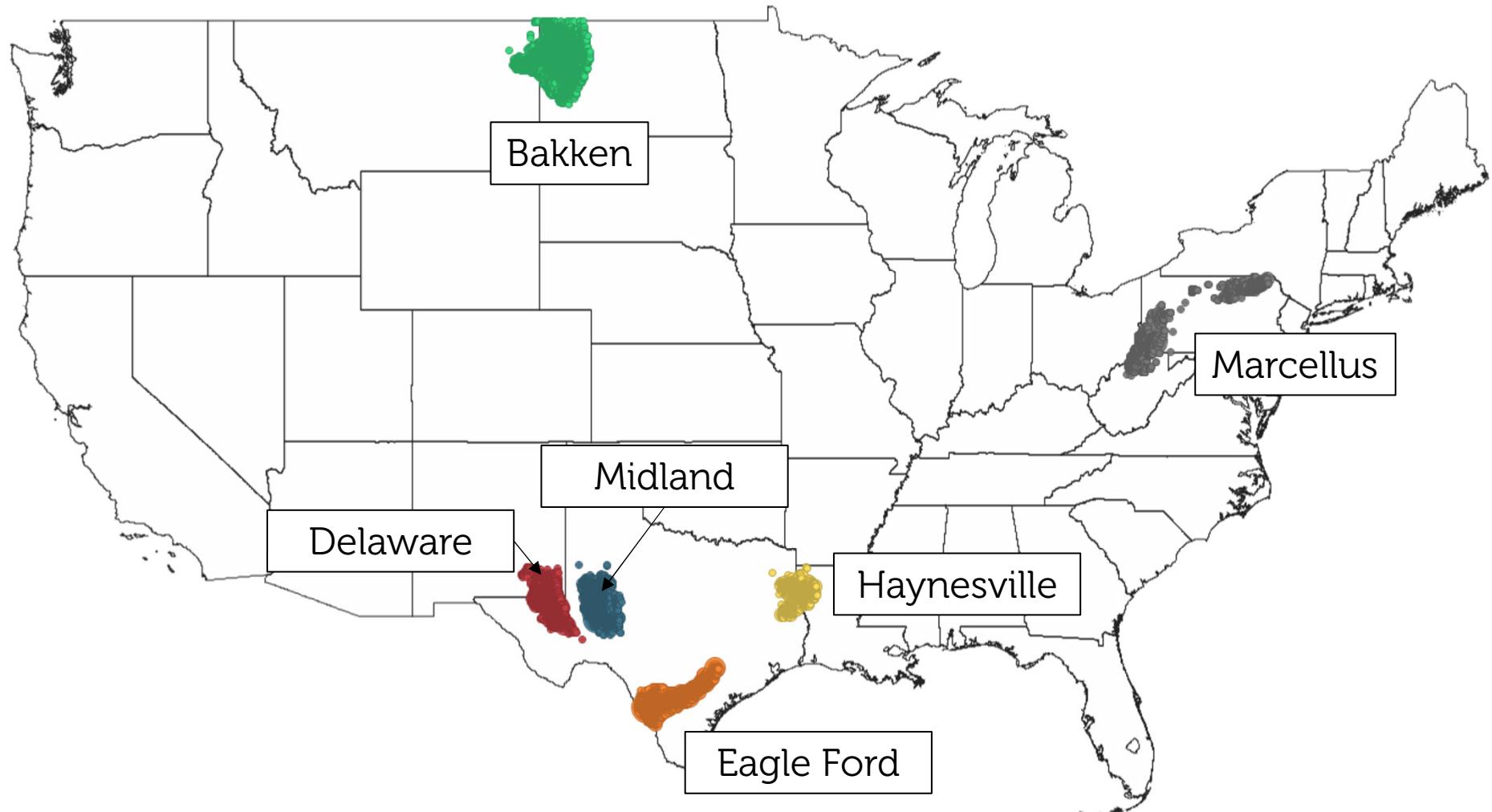


Log

Comparative Type Curves by Vintage
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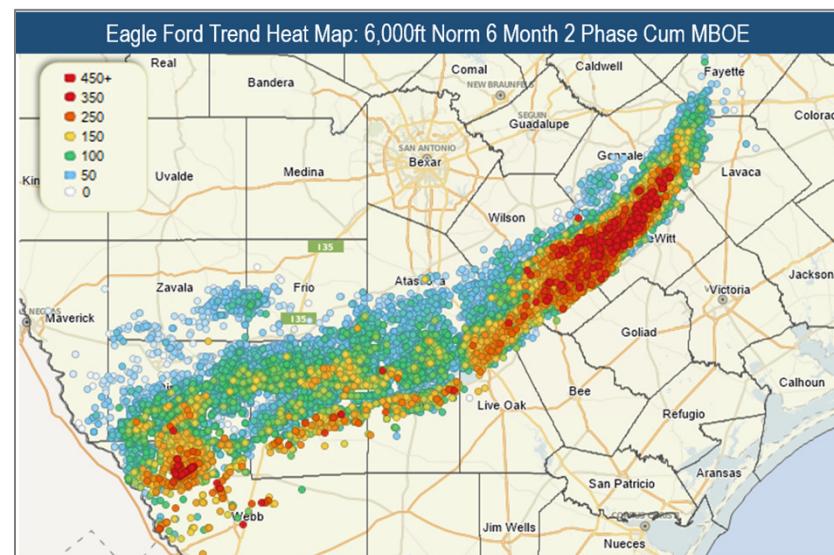
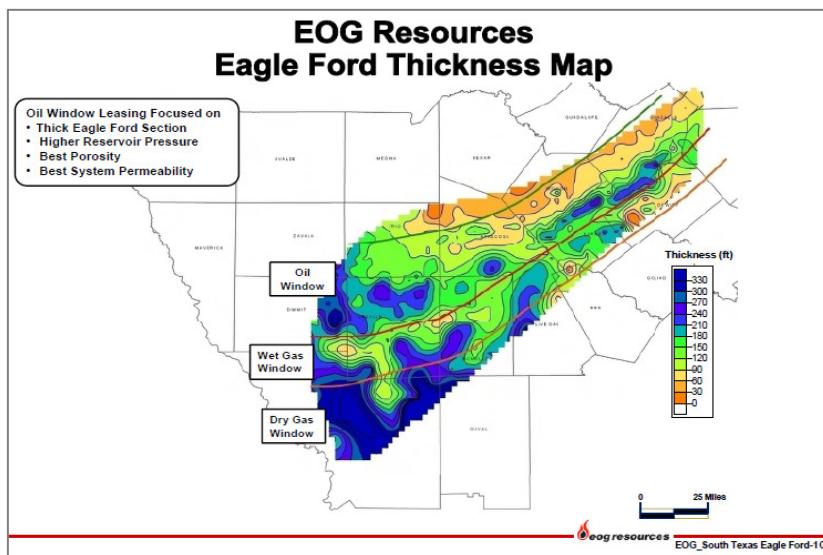
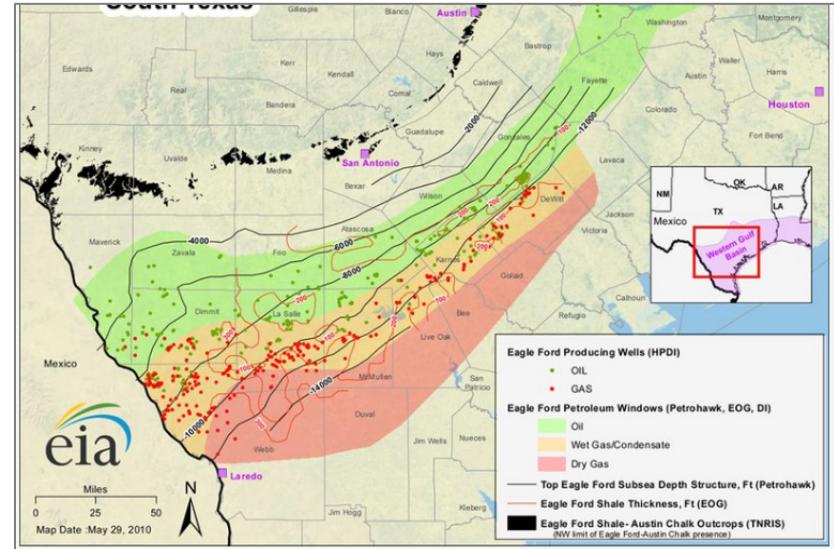
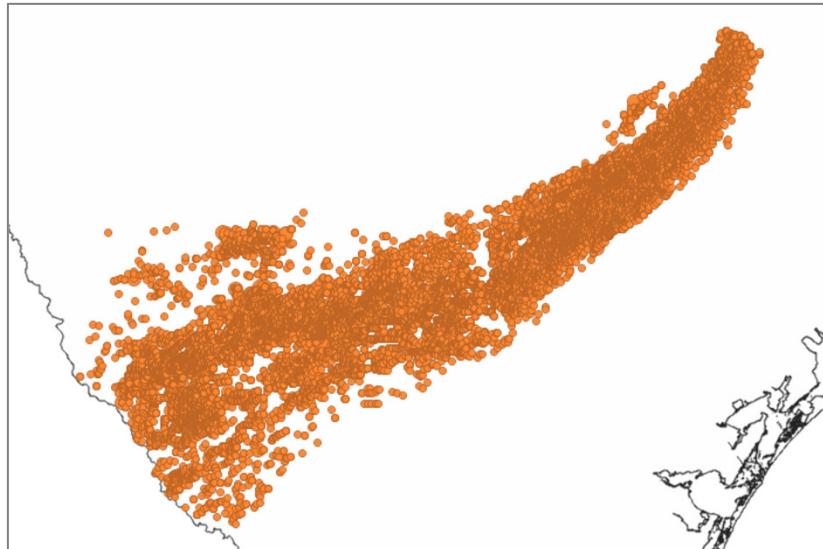
Basins Considered



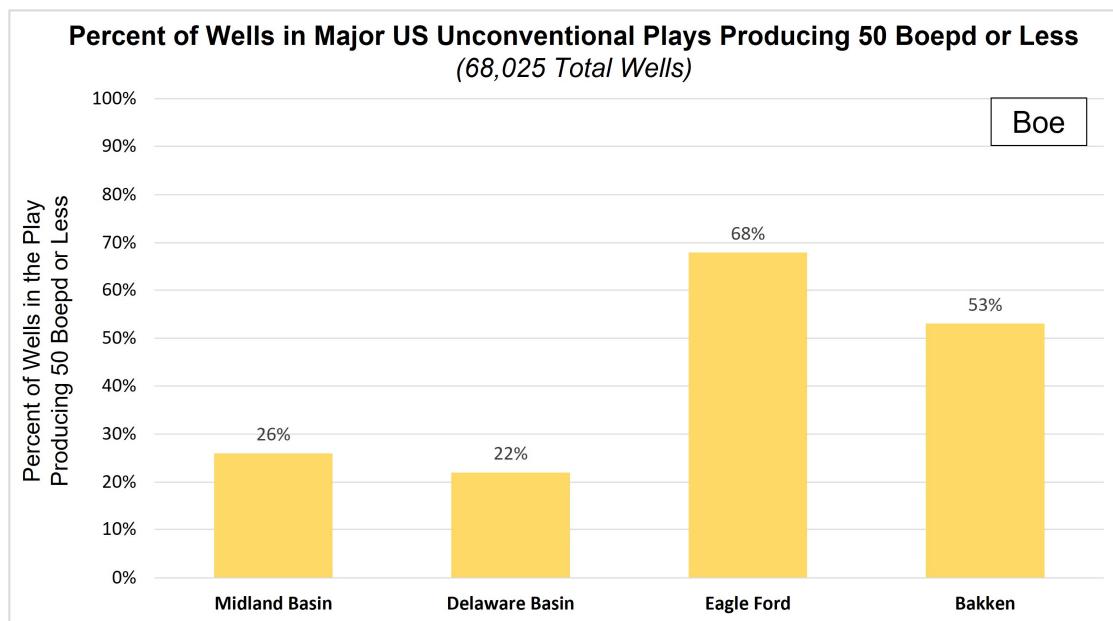
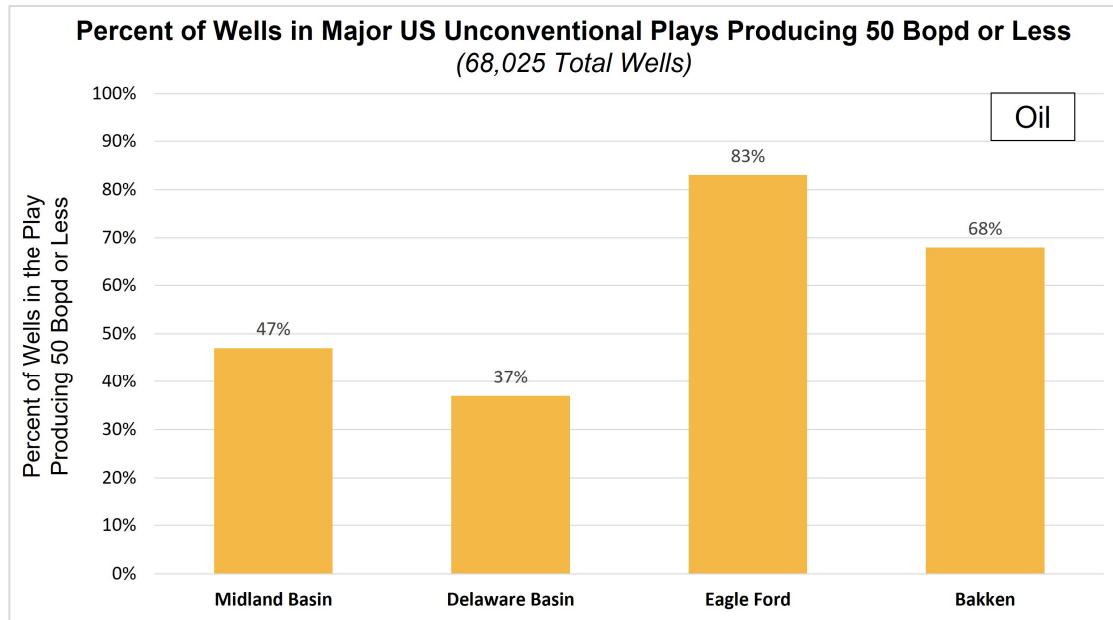
High Level Look



Macro-level look for high-level takeaways from an M&A point of view, Eagle Ford example:



Major US Oil Plays



Why 50 bopd?

Somewhat arbitrary

Not as low as stripper well classification

Not meant to be an economic limit

Rates at which many wells are:

- Converging to long-life matrix flow or supposed "terminal decline"
- Rates much, much lower than IP and early life

Given the above – rates at which economic considerations are much different than new drills

Not at the P&A or ADR obligation point which is closer to 5-10 bopd at current strip

~30% of the wells in the study are at or under the stripper well classification of 15 bopd

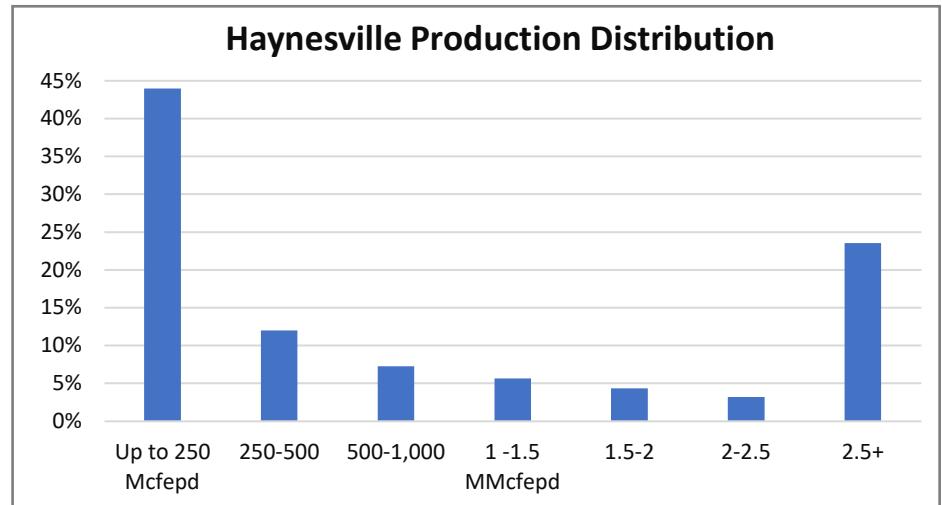
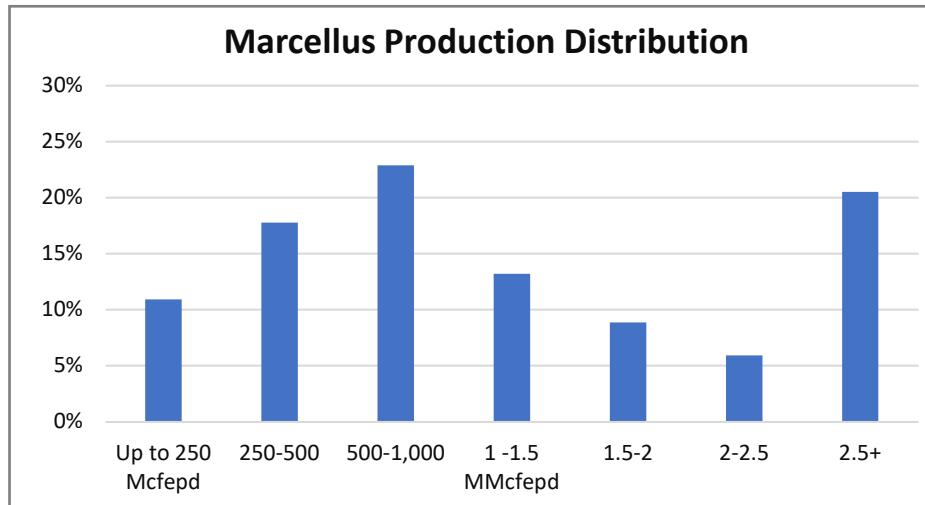
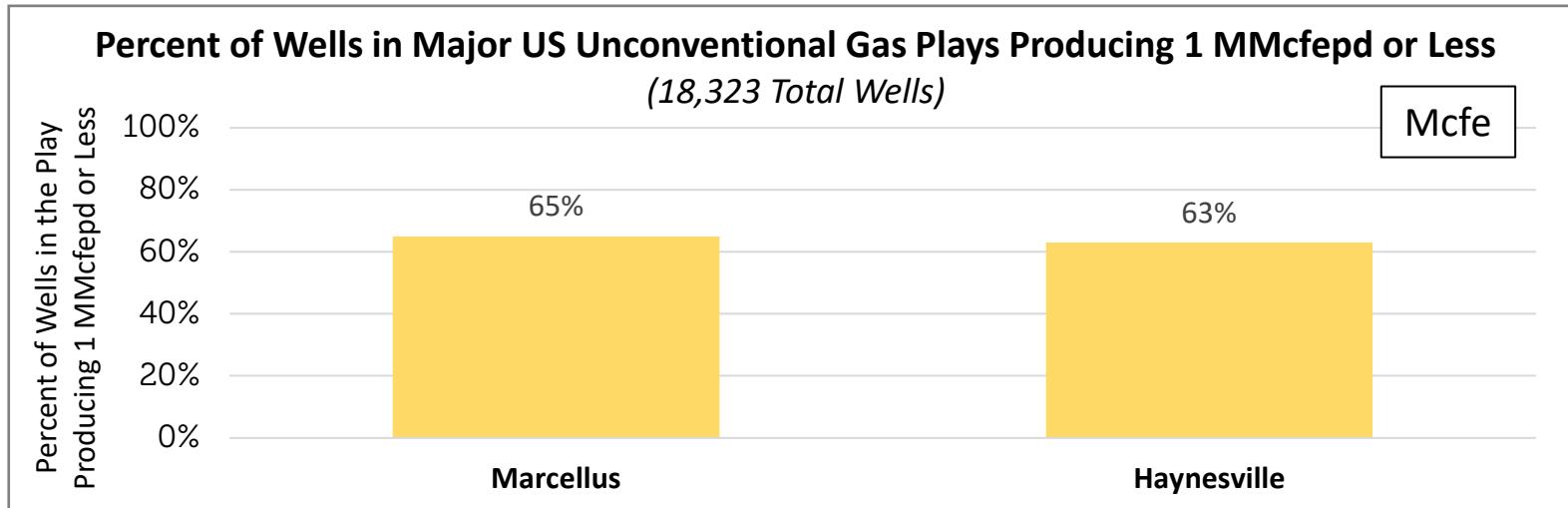
At \$100,000 P&A cost that is ~\$2B in liability

At \$30,000 P&A cost ~600MM

Major US Gas Plays



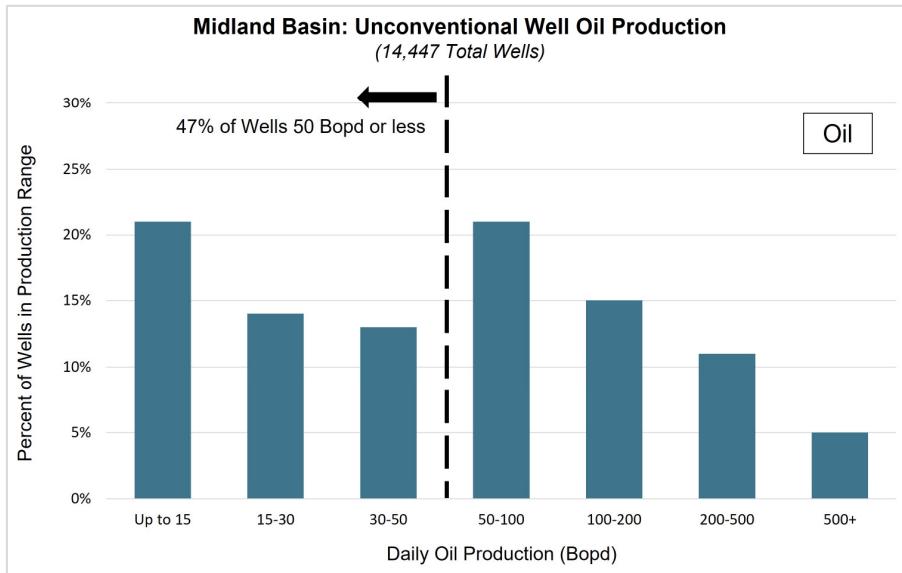
The Marcellus and Haynesville have a similar amount of wells under 1MMcfpd but very different distributions



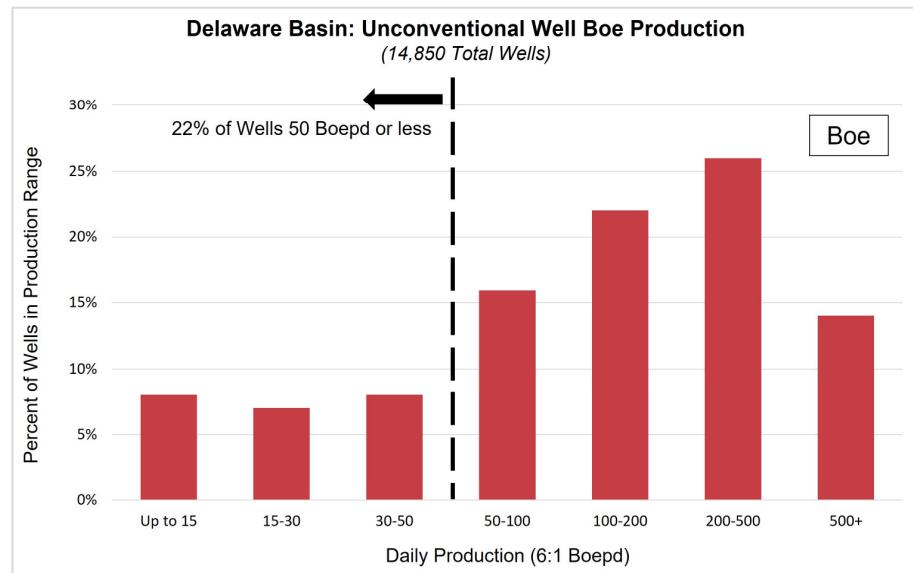
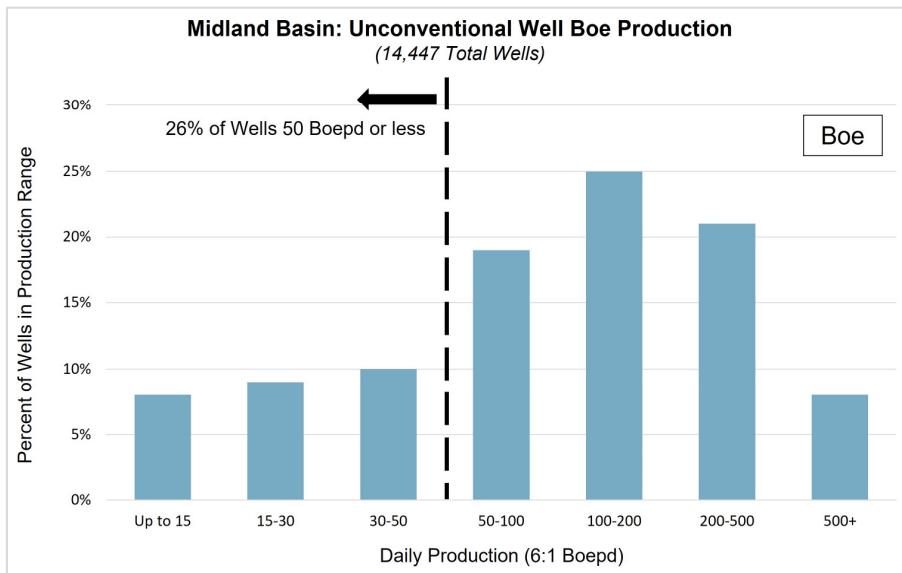
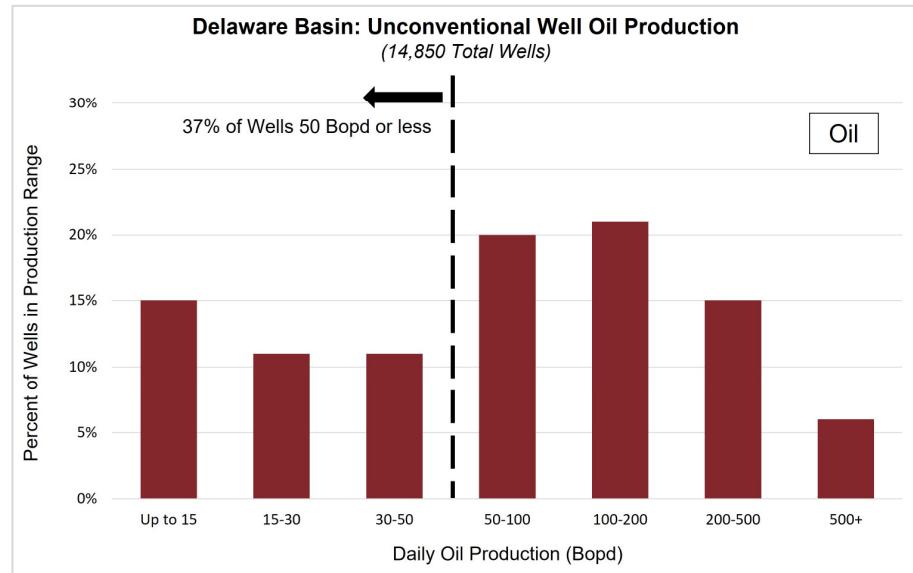
Permian Unconventional



Midland Basin



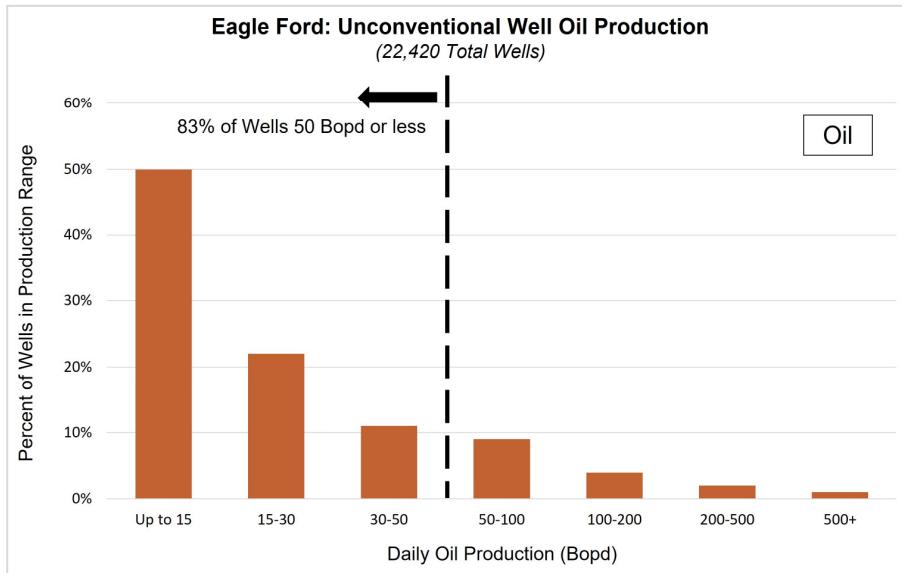
Delaware Basin



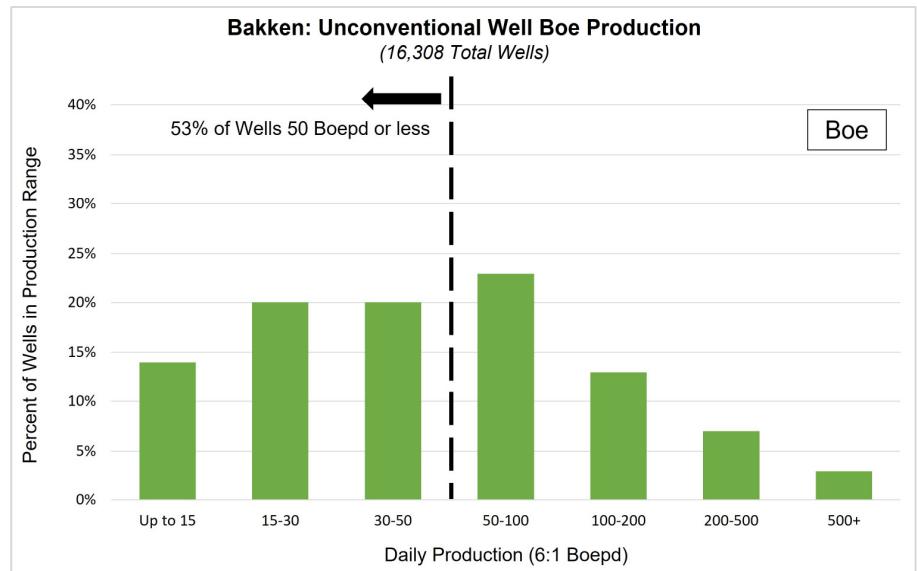
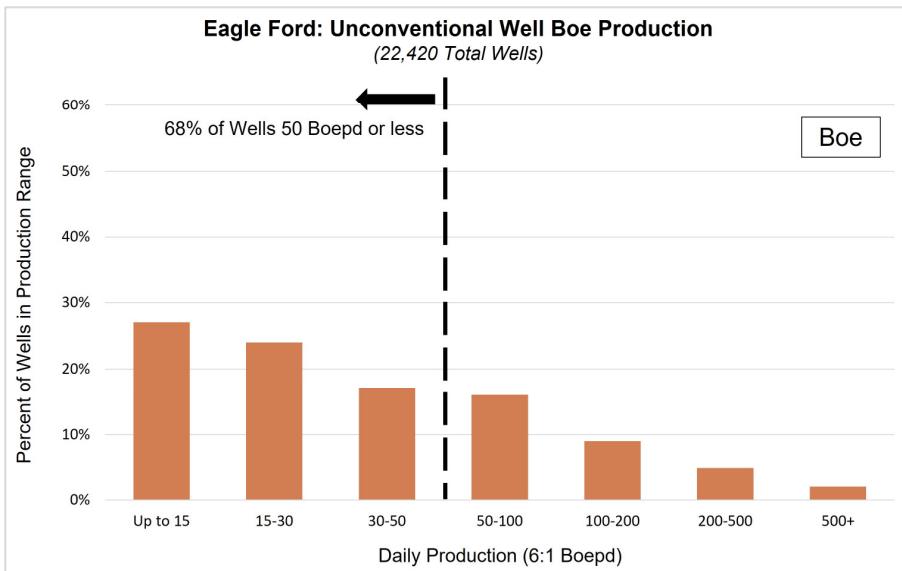
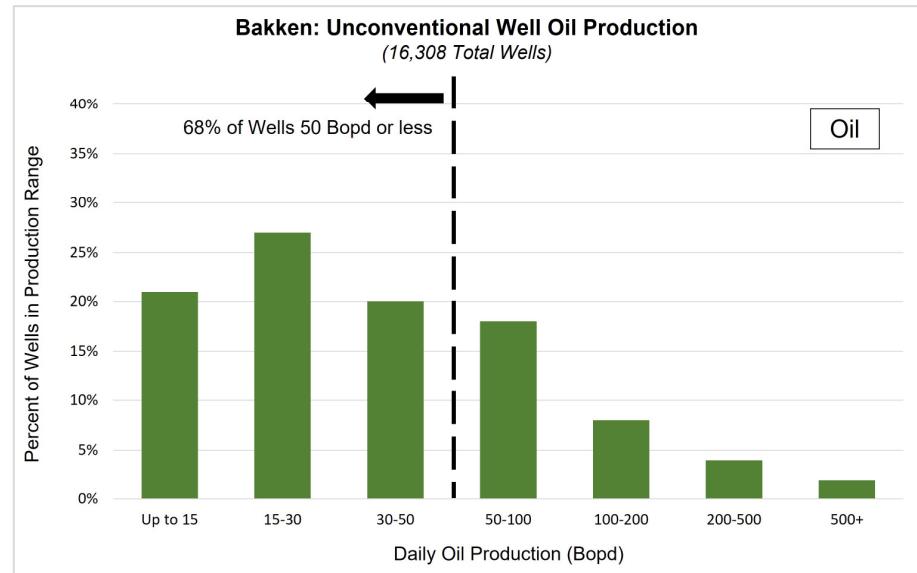
Mature Unconventional



Eagle Ford



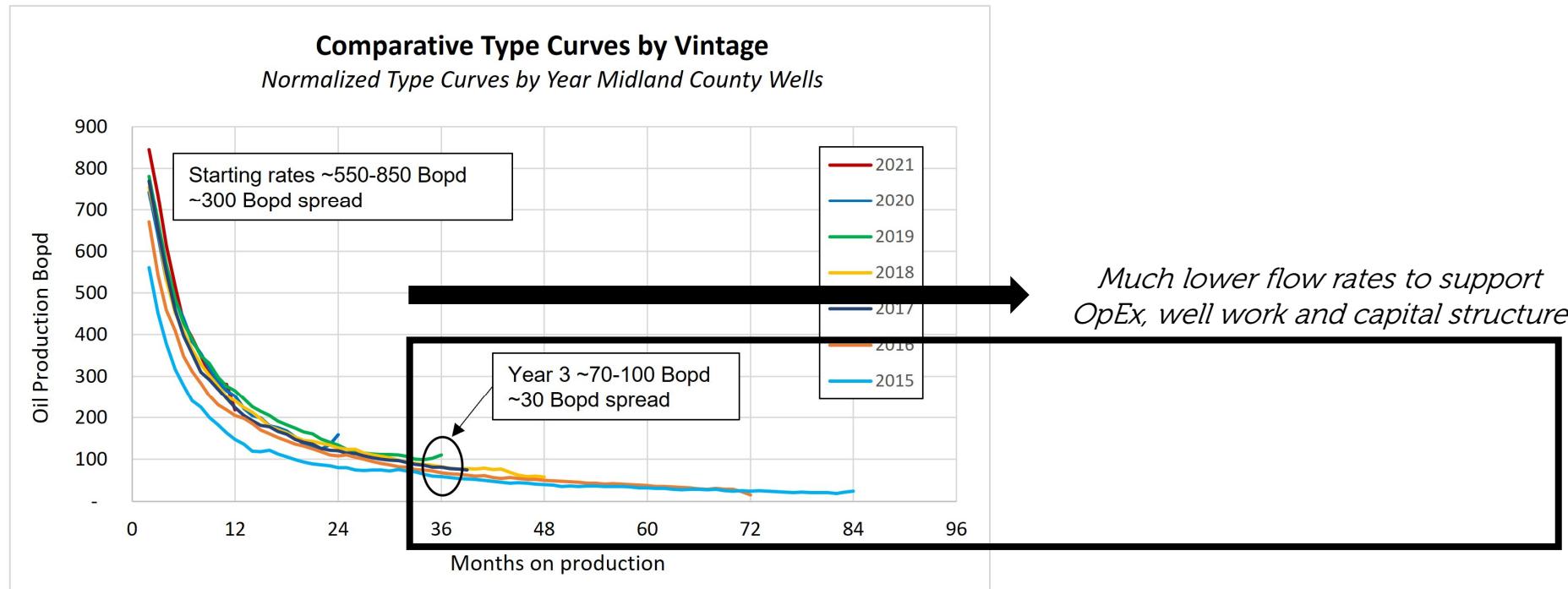
Bakken



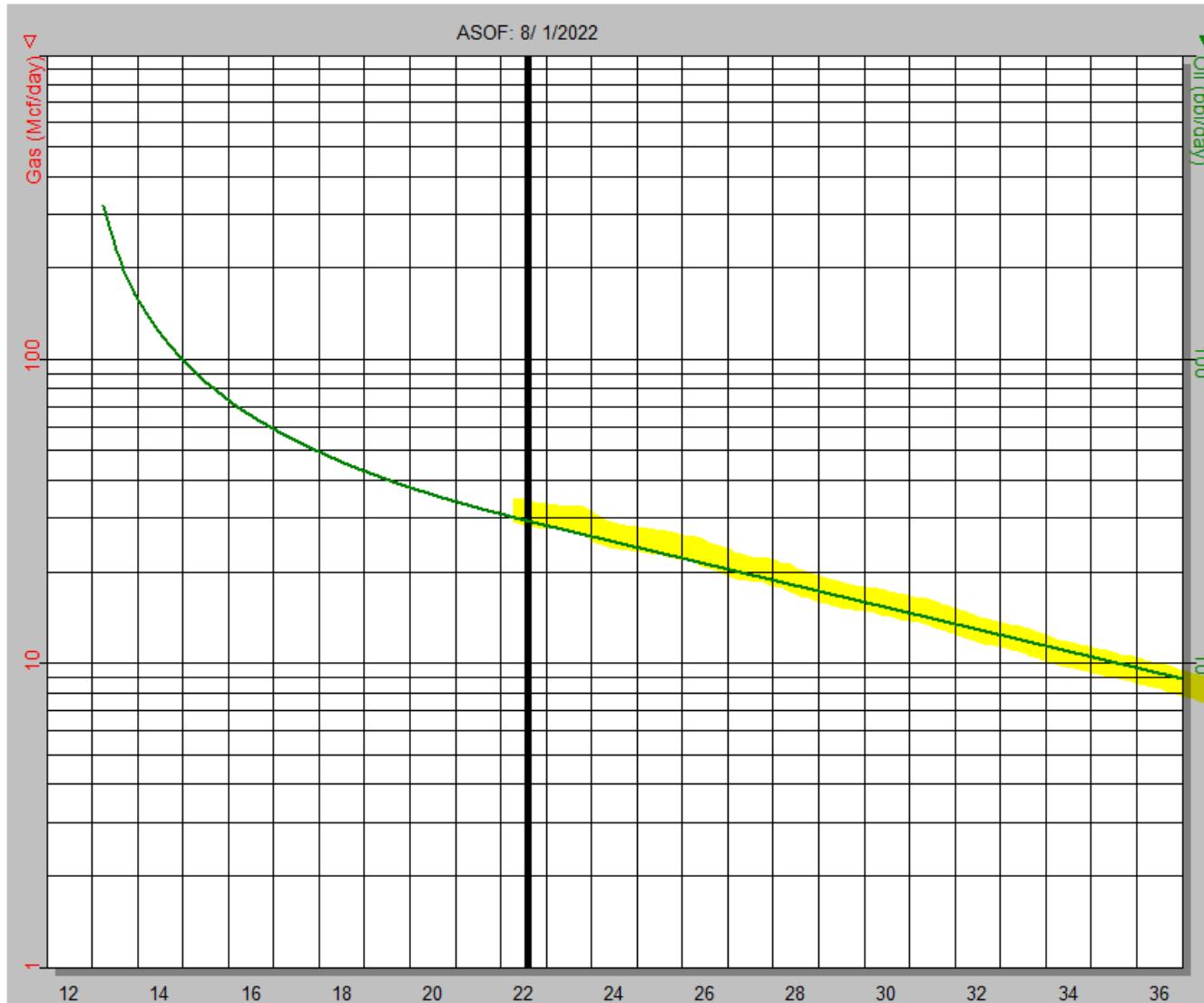
Why Does it Matter?



- US Unconventional Plays are aging fast
- Many HZ wells are moving into matrix type flow after only 3-5 years, with much lower rates
- Generally payouts must happen fast or won't happen at all
- After the first 3-5 years there are often issues with economic viability of HZ wells especially in M&A
 - Fixed OpEx "keep the lights on" (much higher than conventional VT)
 - Repeat failures and workover costs when a well goes down
 - Higher rates of terminal decline
 - Burden of G&A, COPAS, and capital structures (ex aggregator PE firms with high fees)
 - Limited options on increasing production (ex re-fracs and EOR)



Sample Well – Single Phase Oil



Unconventional well in later-life terminal decline

30 Bopd GROSS as-of 8/1/2022
~8% exp annual decline
100% WI, 75% NRI

\$80/bbl with
Additional -\$3.50 deduct

\$8,000/well/month OpEx
4.6% Oil Sev Tax, 2.5% AdVal

No income taxes
No P&A
No workovers
No company overhead

Positive cash flow for ~20 years
PHDwin v2 model
\$3.85 MM non disc CF
\$2.36 MM PV10

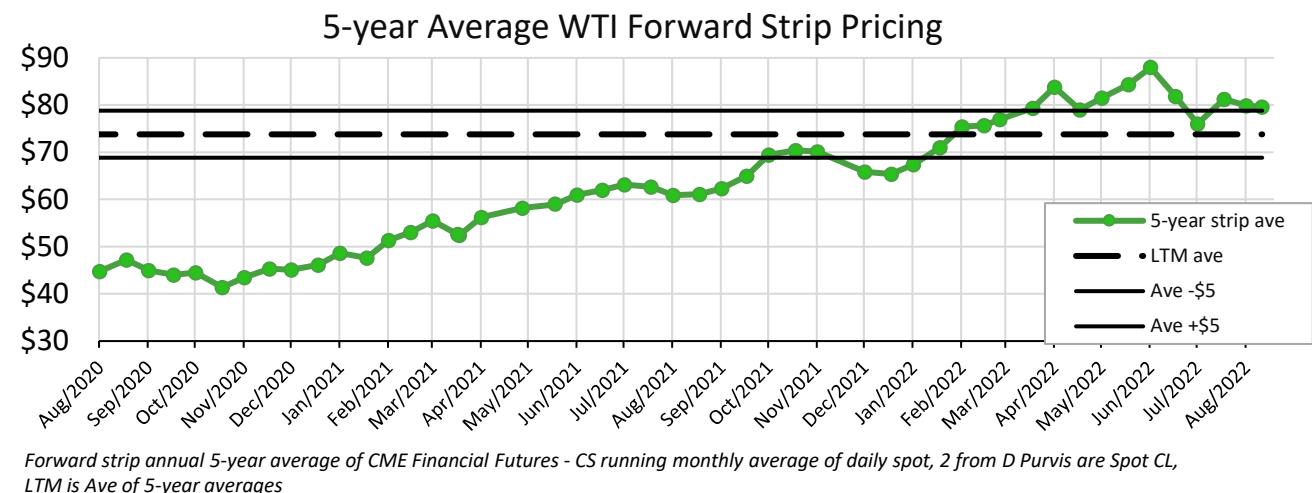
Oil Well Economics - Pricing



- At high oil prices many profitability issues do not "show up"
- Lot of "gotchas" when oil price falls again
- Does NOT consider hedging
- No overhead, return hurdles, cost of capital, capital structure consideration, or fees

Scenario (ALL have additional -\$2.50 diff)	Well PV10 (\$M)	Well Life (Years)
Starting Assumptions \$80/bbl	\$2.36	21.8
8/15/2022 Strip	\$2.19	20.3*
\$75 Flat	\$2.15	21.0
\$65 Flat	\$1.74	19.2
\$55 Flat	\$1.33	17.13

8/15/2022 WTI Strip*	
Start Month	Price
Aug 2022	\$90.53
Jan 2023	\$84.76
Jan 2024	\$78.80
Jan 2025	\$74.38
*Jan 2026 and on	\$70.89

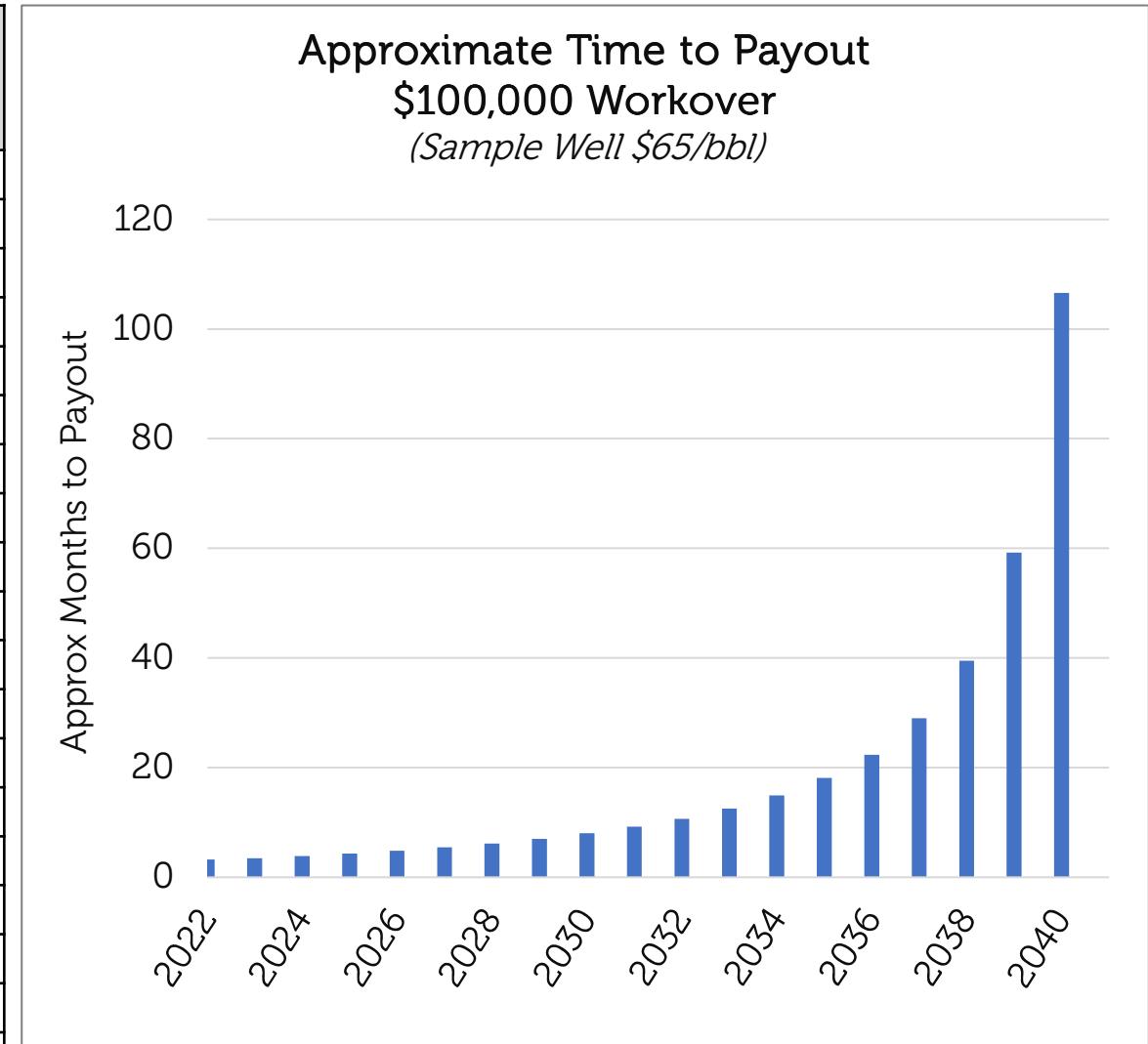


Workovers

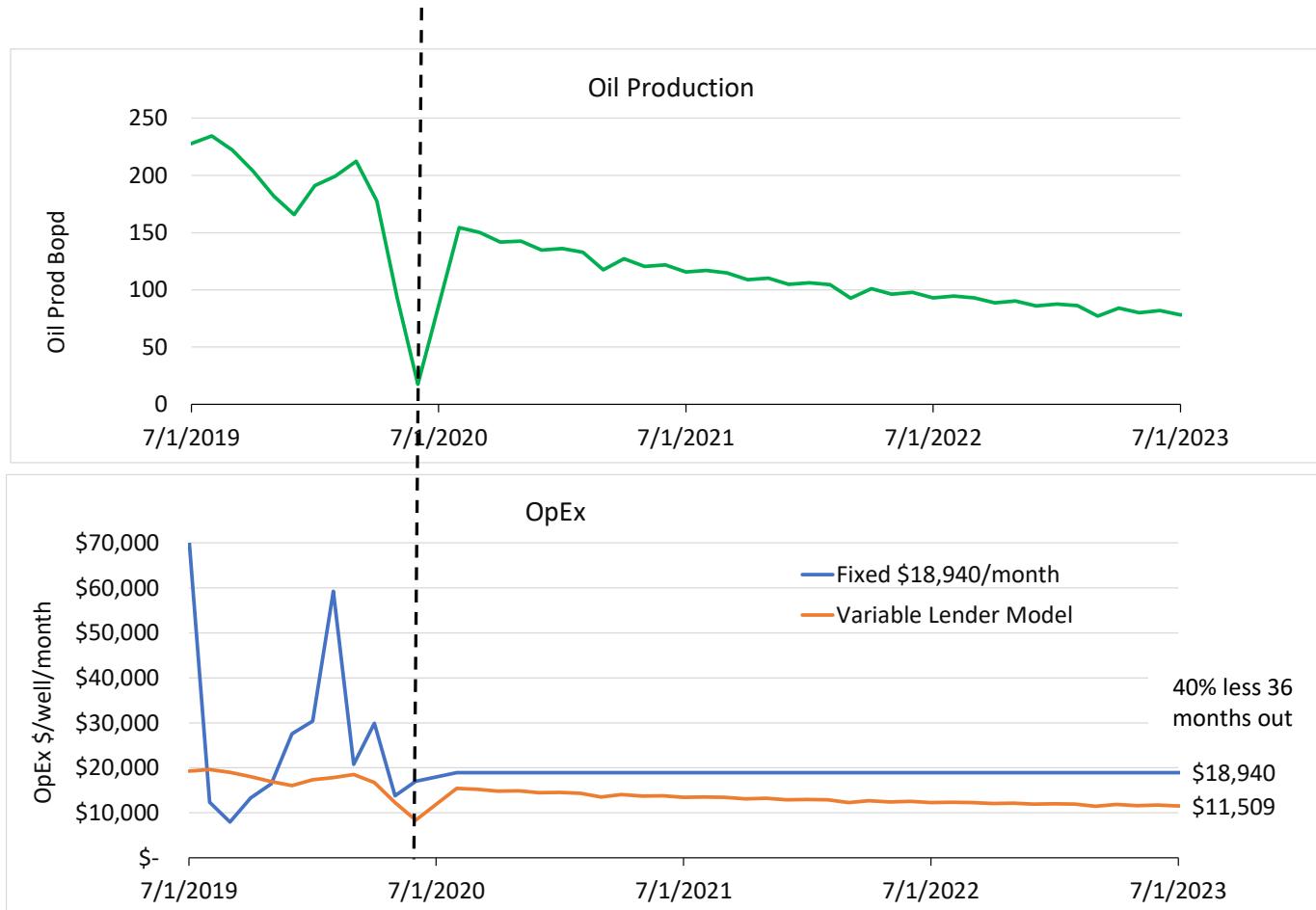


For later-life HZ wells the ECL is often when the well goes down and won't pay out a workover or will take a long time to pay out a workover (increased risk)

Year	Average Monthly Cash Flow \$M	Months to pay out \$100M workover
2022	31	3.2
2023	29	3.5
2024	26	3.9
2025	23	4.3
2026	21	4.8
2027	18	5.4
2028	16	6.1
2029	14	7.0
2030	13	8.0
2031	11	9.2
2032	9	10.6
2033	8	12.5
2034	7	14.9
2035	6	18.1
2036	4	22.3
2037	3	29.0
2038	3	39.5
2039	2	59.2
2040	1	106.6
2041	0.3	288.3



OpEx Example



Lender cost model:

\$7,448/well/month fixed

Oil variable OpEx

\$1.71/bbl

Gas transportation

\$1.36/mcf

Fixed cost model:

LTM LOS Ave excluding
2 high months:

\$18,940/well/month

First 36 months out – variable model is 40% less than fixed

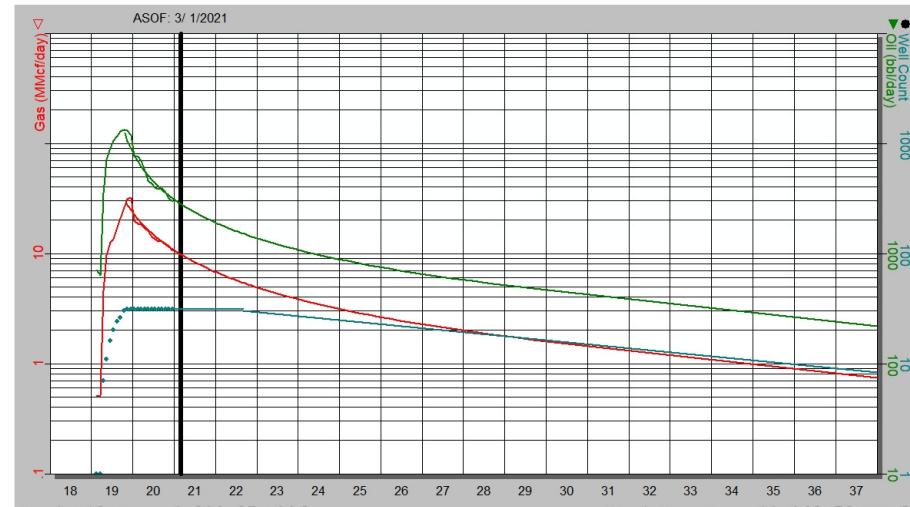
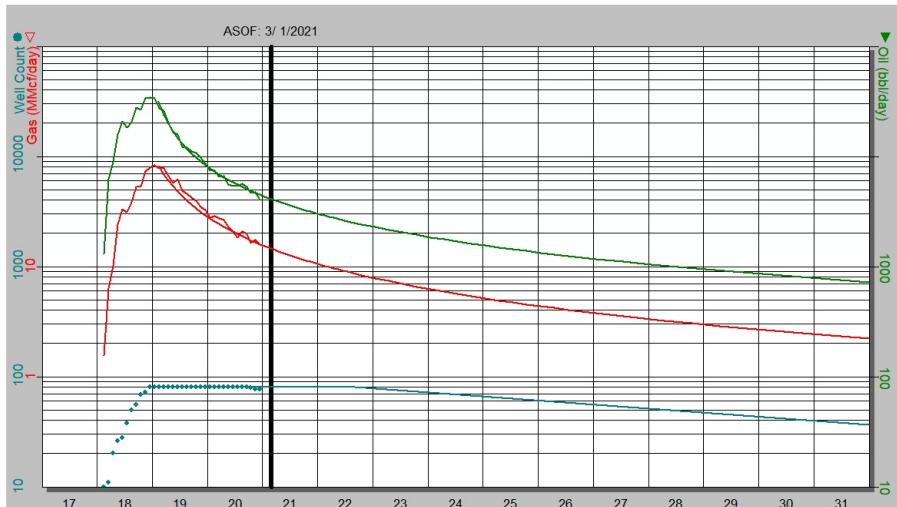
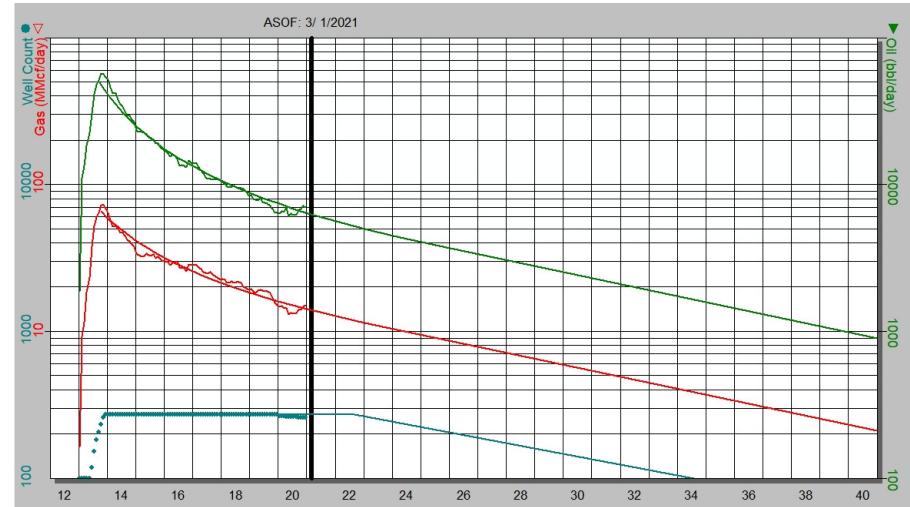
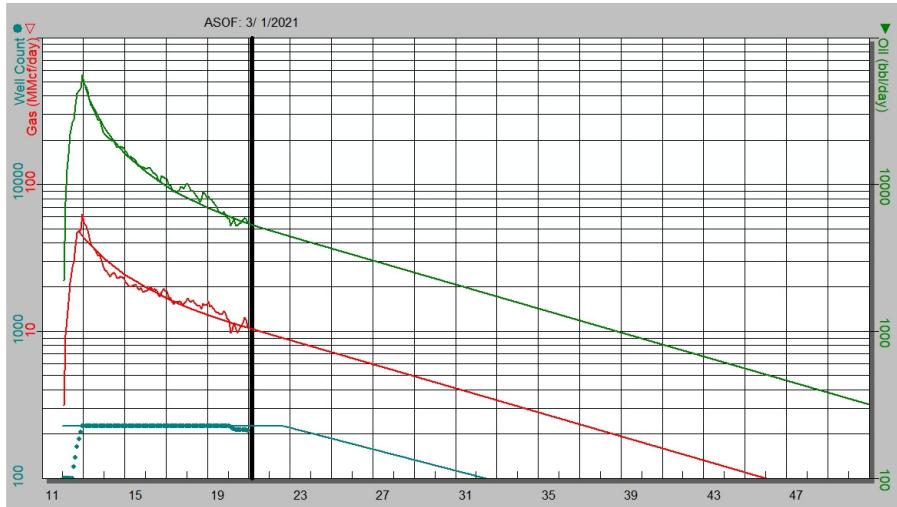
Over time the fixed and variable components diverge even further as production gets lower and lower – in reality the OpEx is somewhere in between the models

Additional Considerations



Terminal declines

- Seeing many areas where terminal decline is much steeper than originally forecast
- Many wells show erratic production and repeat failures with downtime



Additional Considerations



Production Improvement

- Mixed re-frac results based on play, operator, prior development, benches, etc
- Most would agree the “jury’s still out”
- Mineral companies seeing a lot of variation by operator and location in the play, watching attempts in the more mature Bakken and Eagle Ford for what’s to come in the Permian
- EOR being done in a few places – for example EOG in the Eagle Ford

Financial Considerations for Potential Buyers

- Overhead and G&A
- Fee structures – example PE running pref rate before hitting waterfall
- Return hurdles and cost of capital
- Hold and cash flow case is motivating for would be sellers in the high price environment
- Buyer-seller gap driven by major divergence in valuations using cash flow, PV, and flowing barrel comps

P&A Obligations



~30% of the wells in the study are at or under the stripper well classification of 15 bopd

At \$100,000 P&A cost that is ~\$2B in liability

At \$30,000 P&A cost ~600MM

With ~760,000 stripper wells in the US even at \$30,000 P&A that is ~\$23B

"Texas will begin plugging about 800 abandoned oil and gas wells this fall, the state's oil and gas agency said, after receiving an initial \$25 million grant from a program included in President Joe Biden's [#infrastructure](#) plan." [#oilandgas](#)



Texas will plug 800 abandoned oil and gas wells, funded by \$25 million federal infrastructure grant

[texastribune.org • 3 min read](https://texastribune.org/2022/08/26/oil-gas-wells-infrastructure-money-texas-railroad-commission/)

The projected cost to plug and clean up the pollution from all 7,400 documented wells is approximately \$482 million, according to the commission's notice of intent to apply for federal funding obtained by The Texas Tribune.

~\$65,000/well
For 760,000 wells
\$50 Billion!

Takeaways



US Unconventional Plays are aging fast

Many HZ wells are moving into matrix type flow after only 3-5 years, with much lower rates

At lower commodity prices it becomes much more difficult to operate these wells at a profit, especially when considering full cycle M&A

Production improvement has proven difficult (ex re-fracs and EOR)

Operational excellence and controlling costs become the driver for profitability (weren't a focus during the shale boom)

As rates continue to drop, there is opportunity for those who can operate lean and make money versus larger operators and financial-type groups

Will there be sufficient technical improvements to give these wells a second life or will 10's of thousands of wells depend on controlling OpEx?

How will the geology of an area impact attempts at increasing production?

How will M&A evolve considering the maturity of US assets?

Thank you to the AAPG Women's Network for sponsoring

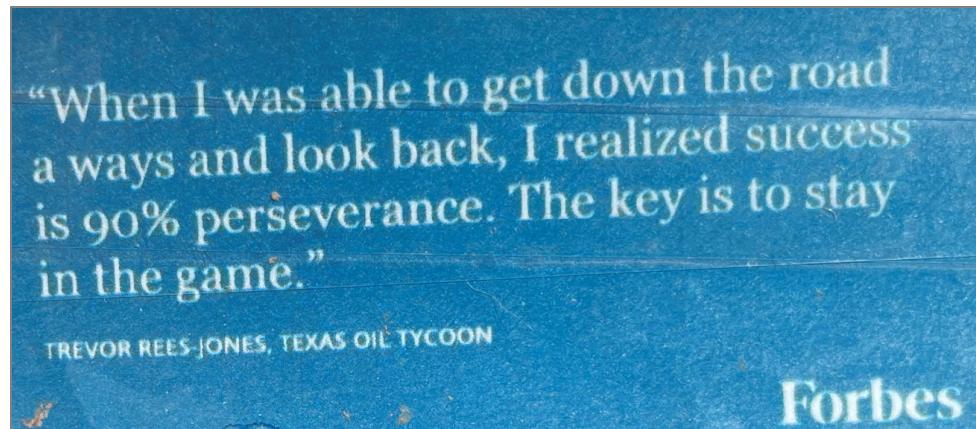
Women are not the only underrepresented group in M&A and O&G Investment Banking

- Age – too “young” and “too old”
- Race
- Technical folks
- Others

My mentor’s advice, “The world is what you make of it, friend. If it doesn’t fit, you make alterations” Stella in the movie Silverado

It’s not pretty and you are going to have to work hard and toughen up to setbacks and criticism

Best advice I can give:



Parting Thought



Enthusiasm is one of the most powerful engines of success.

When you do a thing, do it with all your heart. Put your whole soul into it. Stamp it with your personality.

Be active, be energetic, be enthusiastic and faithful and you will accomplish your objective.

Nothing great was ever achieved without enthusiasm.

- Ralph Waldo Emerson