



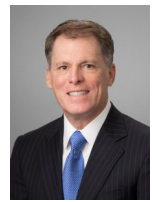
# Weekly E&P Update

March 12, 2024

Vol. 11

## Artificial Lift: Emerging Technologies and Challenges

By Steve Hendrickson  
President of Ralph E. Davis Associates



As a production engineer in the early years of my career, my duties encompassed the design of artificial lift (AL) systems. My work involved the implementation of rod pumps, electrical submersible pumps (ESPs), and gas lift (GL) installations—prevalent techniques that at the time had room for only marginal enhancements. However, as the shale revolution unfolded, advancing from initial gas plays like Barnett, Fayetteville, and Haynesville to more liquid-rich formations, it became clear there was a necessity and a challenge in adapting AL to these new applications.

Unconventional wells are characteristically deep and deviated, sometimes producing frac sand—complications that can hinder the minimization of bottom hole pressure (BHP) to optimize ultimate recovery. Each AL technique offers unique advantages and limitations. Rod pumps excel in achieving low BHP but struggle with solids and tend to fail in deviated wells. Gas lift handles both deviated and high-solids wells, but reaching minimal BHP can be challenging. ESPs perform optimally in high-volume and deviated wells but falter in the presence of solids, leading to reliability issues, particularly as fluid production wanes and equipment cycling becomes more frequent.

The Society of Petroleum Engineers' Journal of Petroleum Technology recently published articles on AL advancements that piqued my interest. Notably, there's been an [uptick in technical papers related to AL](#). One article provided [insights from a panel discussion](#) among industry experts about AL's current landscape. Key insights include:

**Gas Lift Revival:** A JPT piece echoed a [2017 commentary](#) by AL specialist Mike Berry, who, somewhat reluctantly, asserted that gas lift ought to be the default AL method for shale wells. Shauna Noonan observed in 2022 that professionals skilled in gas lift, once active in Louisiana's Gulf of Mexico, have since migrated to Midland. Despite the notorious complexity in optimizing gas lift, strides in surface-controlled gas lift valves and the broader implementation of continuous downhole pressure monitoring are addressing these hurdles.

**Permanent Magnet Motors (PMMs):** Termed a "revolutionary advancement" in the ESP sector, PMMs surpass traditional induction motors in efficiency, operational duration, and power output per foot—an essential feature in deviated wells, which are prone to extra failure points with tandem induction motors. PMMs also offer a broader performance range but introduce a unique safety concern during installation and removal as they generate electricity whenever fluids reverse flow through the motor.

**Progressive Cavity Pumps (PCPs):** PCPs offer numerous operational advantages, including handling moderate to high fluid volumes and solids and commendable run times. Their wide adoption was initially limited as they were predominantly operated on rotating rod strings, which led to tubing wear and rod failures. The integration of PMMs to drive the pump may bolster their widespread use.

**Addressing Future Challenges:** The group acknowledges the potential for ongoing enhancements in AL technologies. Priorities include improving the lifting of mature horizontal shale and deepwater oil wells, refining GL system optimization, lowering emissions, and incorporating data analytics, machine learning, and AI to bolster system reliability.

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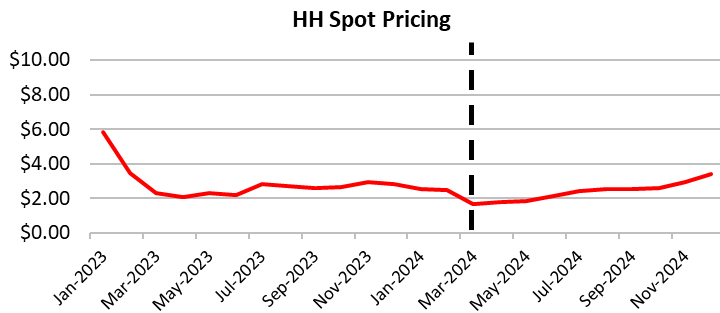
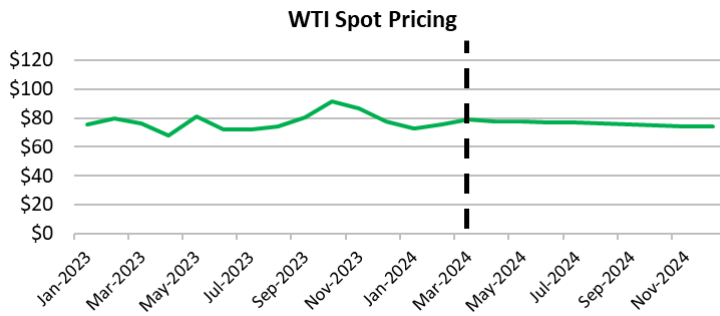
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## NYMEX FUTURE PRICING



## MONDAY'S MARKET CLOSE

### **NYMEX WTI CRUDE OIL FUTURES as of March 11, 2024 Close (\$/bbl)**

Period	Current	WoW Change	Last Week	1 Yr Ago
2024	\$76.02	(\$0.88)	\$76.90	\$71.90
2025	\$71.26	\$0.03	\$71.23	\$67.78
2026	\$67.85	\$0.33	\$67.52	\$64.43
2027	\$65.72	\$0.44	\$65.28	\$61.61
2028	\$64.56	\$0.48	\$64.08	\$59.15

### **NYMEX HH NATURAL GAS FUTURES as of March 11, 2024 Close (\$/MMBtu)**

Period	Current	WoW Change	Last Week	1 Yr Ago
2024	\$2.46	(\$0.05)	\$2.51	\$3.72
2025	\$3.44	(\$0.02)	\$3.46	\$4.25
2026	\$3.78	\$0.01	\$3.77	\$4.32
2027	\$3.79	\$0.01	\$3.78	\$4.27
2028	\$3.77	\$0.04	\$3.73	\$4.23

## INDUSTRY METRICS—QUICK SNAPSHOT

	<b>Current</b>	<b>Last Week</b>	<b>WoW Change</b>	<b>%Change</b>
Crude Oil Near-Month Price (\$/bbl)	\$77.80	\$78.74	(\$0.94)	(1%)
Natural Gas Near-Month Price (\$/MMBtu)	\$1.81	\$1.93	(\$0.12)	(6%)
Weekly Upstream-Deal Transaction Value (\$MM)	\$0.00	\$100.00	(\$100.00)	(100%)
Weekly Number of Upstream-Deal Transactions	3	3	0	-
Current Total US Rig Count	622	629	(7)	(1%)
US Field Crude Oil Production (MMbbl/day)	13.2	13.3	(0.1)	(0.8%)
US Field Dry Natural Gas Production (Bcf/day)	105.8	107.5	(2)	(2%)
Commercial Crude Oil Stocks-Excluding SPR (MMbbl)	449	447	2	0.3%
Natural Gas Stocks-Working Gas Underground Storage (Bcf)	2,334	2,374	(40)	(2%)
Total Drilled But Uncompleted Wells (DUC-Last Month)	4,386	4,386	0	-

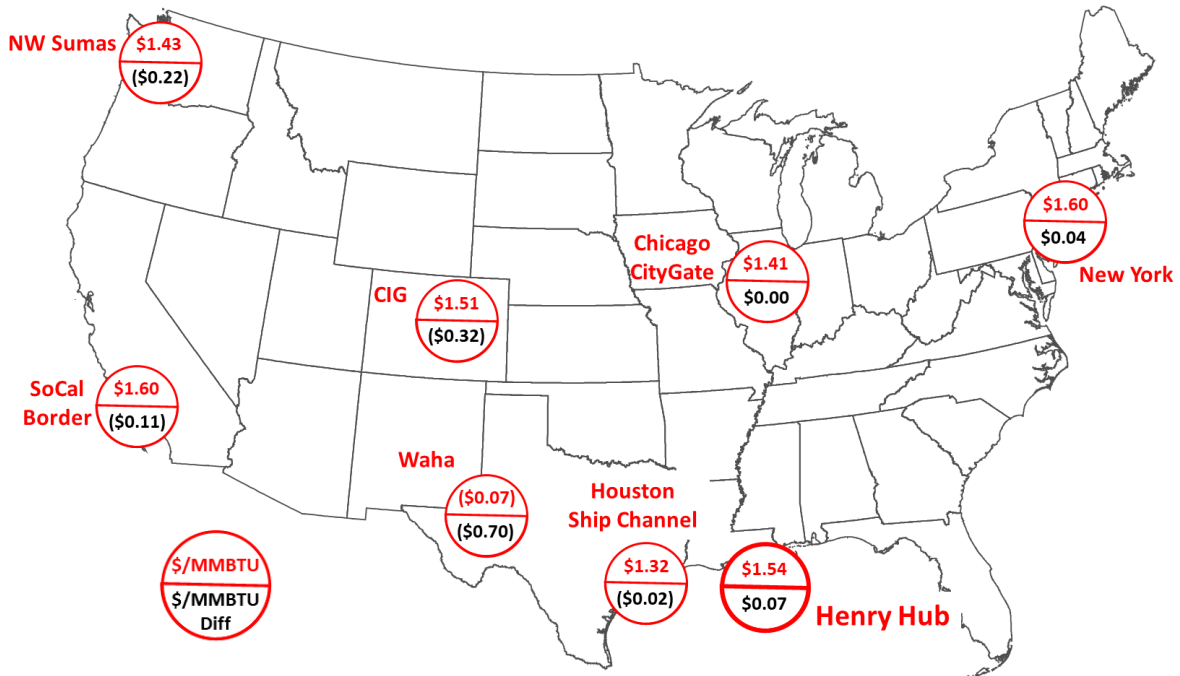
\*Source—Energy Information Administration, United States (EIA)

\*Source—Baker Hughes North America Rotary Rig Count & PLS M&A Database

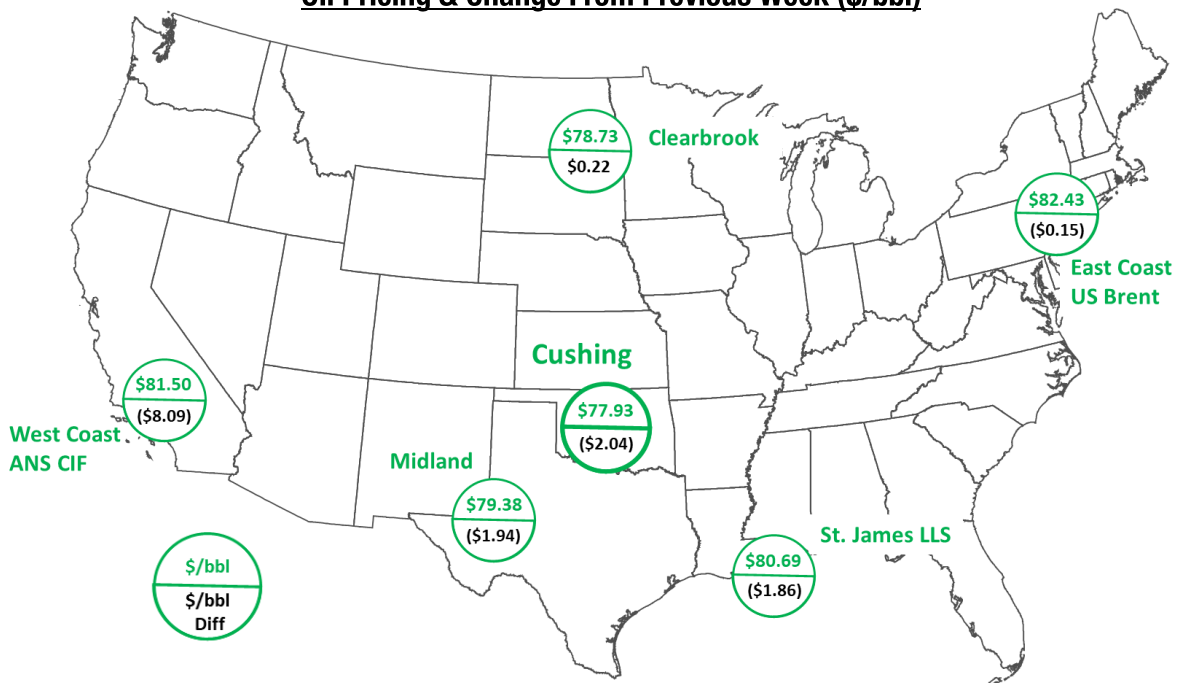


**US COMMODITY PRICES CONTINUED**

**Natural Gas Pricing & Change From Previous Week (\$/MMBtu)**



**Oil Pricing & Change From Previous Week (\$/bbl)**



\*Source—Bloomberg LP



## **SELECTED INDUSTRY HEADLINES**

### **More Productive Wells Spur U.S. Crude Oil Production Higher**

U.S. crude oil production averaged 13.3 million barrels per day (b/d) in December 2023, following sustained productivity increases at new wells, according to our latest Petroleum Supply Monthly (PSM).

### **The Biggest Topics in Global Upstream**

Some upstream oil and gas sectors gave us supply surprises in 2023, with some regions producing above expectations, others disappointing.

### **Oil Industry Consolidation in the Legislative Spotlight**

U.S. oil and gas companies spent a combined \$250 billion in mergers and acquisitions last year.

### **Oil Prices Edge Lower as Traders Evaluate Latest U.S. Inflation Data**

Crude oil futures edged lower Tuesday as traders assessed the latest U.S. inflation data and what it may mean for the Federal Reserve's decision making on interest rates this year.

### **Oil Prices Stall After Funds Complete Short Covering**

Benchmark oil prices appear to have topped out for the time being after investors finished repurchasing previous bearish short positions in U.S. crude futures and options.

### **North American Drilling Activity Falls**

US drilling activity fell with 622 rotary rigs working this week, officials at Baker Hughes Inc. reported Friday.

### **U.S. Natural Gas Futures Slip Ahead of Storage Report**

Gas futures have risen on recent announcements of production cuts by major producers, although mild temperatures have reined in demand.

### **Natural Gas Futures Limp Into Close, Cash Sinks as Storage Glut Weighs (LOGIN CREDENTIALS REQUIRED)**

Natural gas futures fell on Monday for a fourth session as the possibility of an early season storage build later this week outweighed cooler weather trends into late March.

### **US Carbon Pipeline Company Pledges No Oil Recovery, but Bakken Drillers Want it**

Summit Carbon Solutions, which is trying to build the biggest carbon dioxide capture pipeline in the United States to transport and bury greenhouse gases, has repeatedly pledged its project will not be used by drillers to boost output from oil fields.

### **Midstream Builds in a Bearish Market (LOGIN CREDENTIALS REQUIRED)**

Midstream companies are sticking to long term plans for an expanded customer base, despite low gas prices, high storage levels and an uncertain political LNG future.

### **Texas Challenges Biden's Methane Rule That is "Detrimental" to U.S. Oil and Gas Industry**

Texas is challenging this rule, which is detrimental to the oil and gas industry, which is not only vital to the state's economy, but has also made great strides in emissions reduction.

### **EPA Rule Tees up Legal Battle Over Federal Climate Authority**

EPA's rule to limit methane emissions from the oil and gas sector may be the latest battleground over whether the agency is exceeding its authority to regulate planet-warming emissions.





## **SELECTED RECENT TRANSACTIONS**

### **Civitas, Prioritizing Permian, Jettisons Non-core Colorado Assets**

After plowing nearly \$7 billion into Permian Basin M&A last year, Civitas Resources is selling off non-core acreage from its legacy position in Colorado as part of a \$300 million divestiture goal.

### **Epsilon Energy Bolsters Permian Presence With Pradera Fuego Acquisition, Eyes Future Drilling**

Epsilon Energy's acquisition in Ector County, Texas, underscores its strategic focus on expanding crude oil production in the Permian Basin, positioning the company for growth and operational efficiencies.

### **Esperanza, Andros Capital Partners to Acquire ExxonMobil's Interests in Ursa, Princess Fields**

Esperanza Capital Partners and Andros Capital Partners LLC have announced the execution of a definitive purchase agreement to acquire Exxon Mobil Corporation's assets in the Ursa and Princess fields in the Gulf of Mexico.

### **Chord Energy, Canada's Enerplus to Combine Into \$11 Billion Company in North Dakota's Williston Basin**

Chord Energy Corp. and Canada's Enerplus Corp. said late Wednesday they have agreed to merge in an \$11 billion stock and cash deal with an eye toward establishing a "premier" position in North Dakota's Williston shale basin.

### **Benchmark Buys Revolution Resources' Anadarko Assets in \$145 Million Deal**

Benchmark Energy II is acquiring Revolution Resources just over four years after Revolution bought out Jones Energy Inc.'s Midcontinent portfolio.

### **Bayswater Acquires New Oil and Gas Production, Drilling Assets in DJ Basin**

Bayswater Exploration & Production, a Denver-based oil and natural gas development company, recently acquired assets that will continue to expand its operations in the Denver Julesburg Basin in Weld County, Colorado.

### **Diamondback Agrees to \$26 Billion Deal to Buy Endeavor Energy in Growing Permian Push**

Shale producer Diamondback Energy said on Monday it would buy the largest privately held oil and gas producer in the Permian Basin, Endeavor Energy Partners, in a cash-and-stock deal valued at about \$26 billion, including debt.

### **California Resources Corporation to Combine With Aera Energy**

California Resources Corporation announced the signing of a definitive merger agreement to combine with Aera Energy, LLC in an all-stock transaction valued at approximately \$2.1 billion.

### **Vital Energy Closes Deal to Acquire Additional Interests in Permian Basin Assets**

The \$78-million deal gives Vital Energy additional working interests in producing assets associated with the recent asset acquisition from Henry Energy LP, Moriah Henry Partners LLC, and Henry Resources LLC.

### **Silver Hill Energy Partners to Buy Liberty Resources' North Dakota Assets**

Silver Hill Energy Partners said it would acquire Liberty Resources II's interests in oil and gas properties and all of Liberty Midstream Solutions in North Dakota for an undisclosed amount.

### **Permian Resources Unveils Two Bolt-on Acquisitions For \$175 Million**

Permian Resources announced a series of deals consisting of two bolt-on acquisitions, an acreage swap, a sale of non-core assets and additional grassroots acquisitions.

### **W&T Offshore to Increase Oil and Gas Production With \$72 Million U.S. Gulf of Mexico Acquisitions**

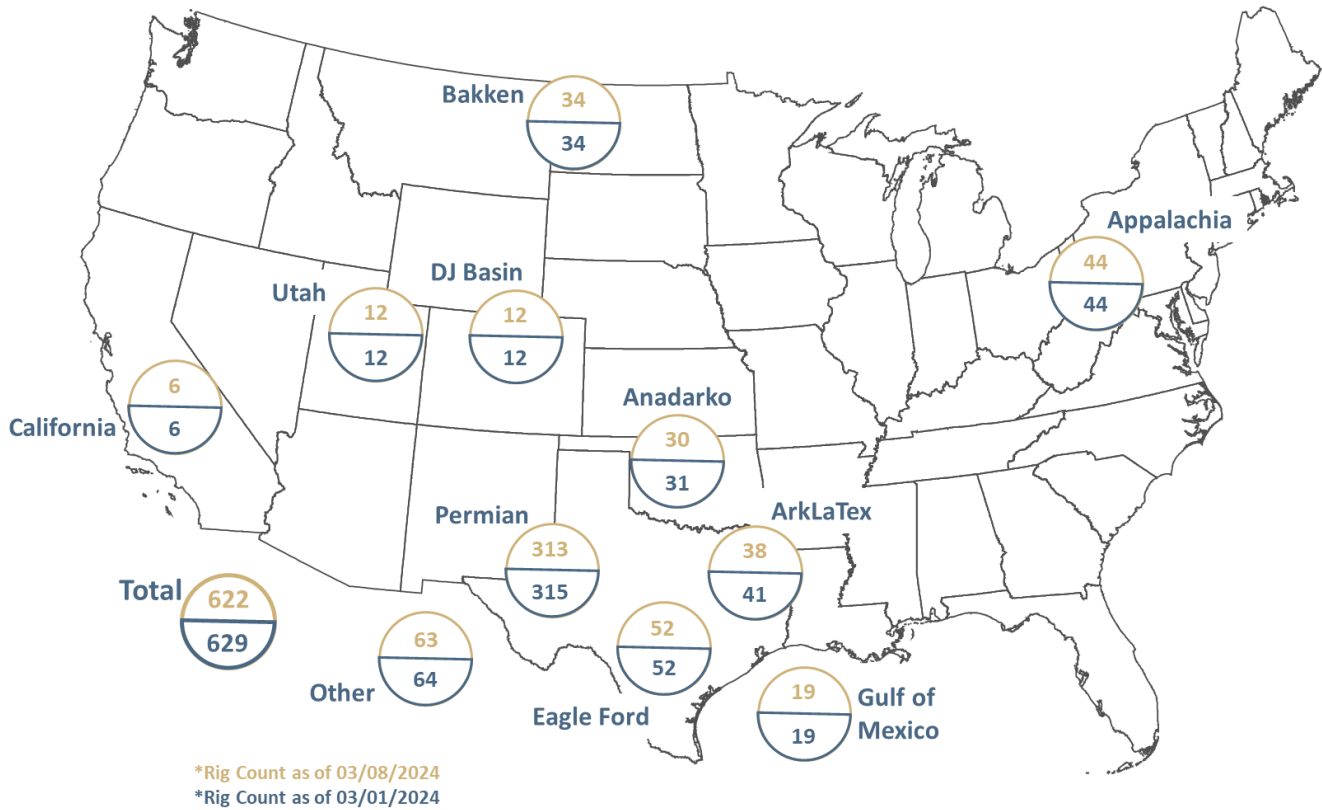
W&T Offshore, Inc. has completed the accretive acquisition of six fields in shallow waters of the U.S. Gulf of Mexico.

### **Talos Energy to Acquire QuarterNorth Energy For \$1.29 Billion**

Oil and gas company Talos Energy, said it will acquire privately held QuarterNorth Energy in a \$1.29 billion cash-and-stock deal to bolster its presence in the Gulf of Mexico.



## RIG ACTIVITY BY US REGION

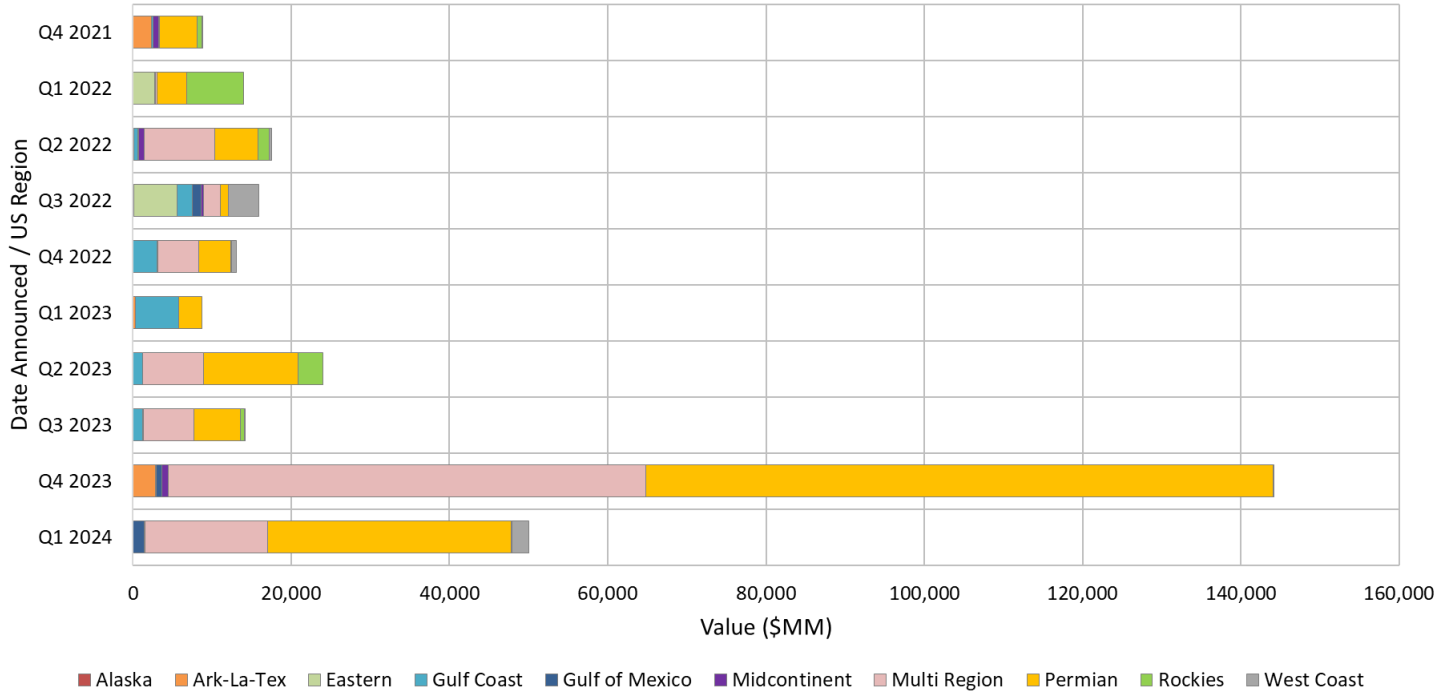


U.S. Rig Breakouts	Week Ending 03/08/2024			Week Ending 03/01/2024		Week Ending 03/10/2023
	Count	+/-	Count	+/-	Count	
Oil	504	(2)	506	(86)	590	
Gas	115	(4)	119	(38)	153	
Not Specified	3	(1)	4	0	3	
Directional	52	0	52	10	42	
Horizontal	557	(4)	561	(135)	692	
Vertical	13	(3)	16	1	12	
Land (Inc Others)	601	(7)	608	(130)	731	
Inland Waters	0	0	0	(1)	1	
Offshore	21	0	21	7	14	
<b>US Total</b>	<b>622</b>	<b>(7)</b>	<b>629</b>	<b>(124)</b>	<b>746</b>	

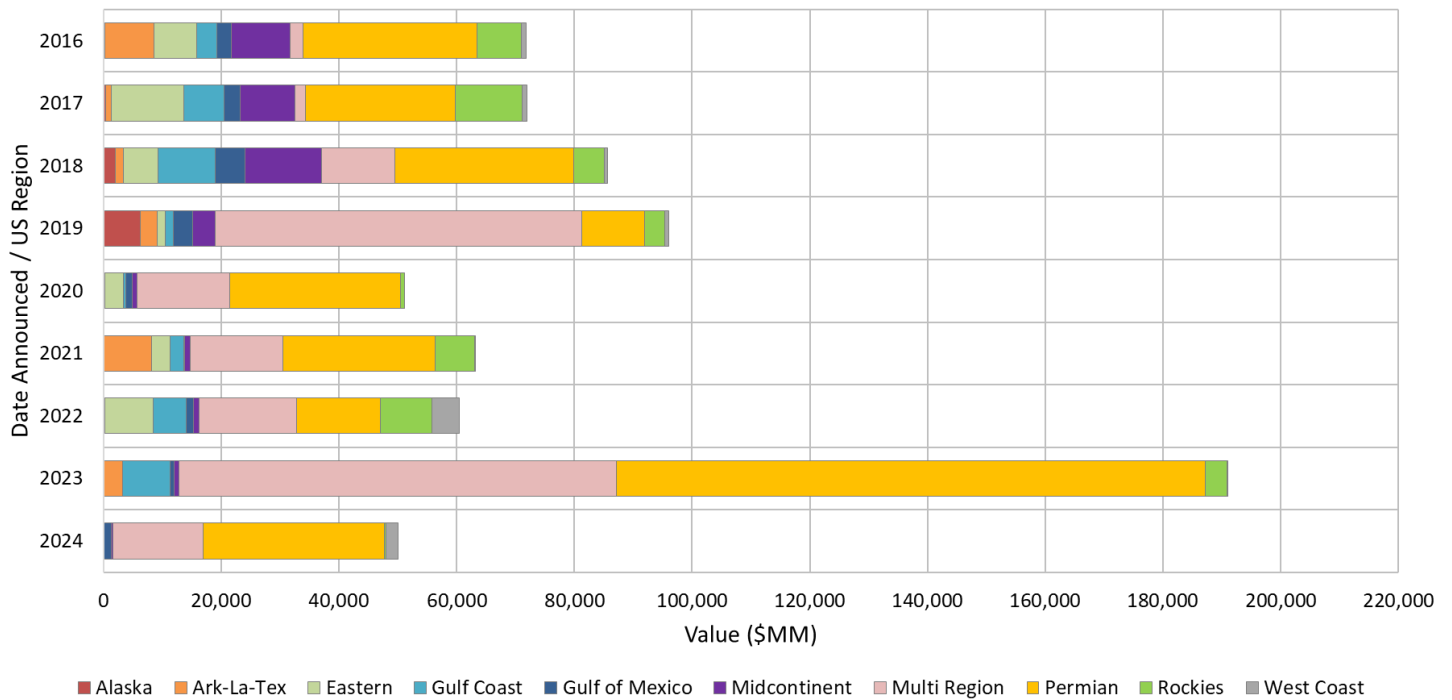
\*Source—Baker Hughes Weekly Rig Counts



## DEAL VALUE BY US REGION (BY QUARTER)



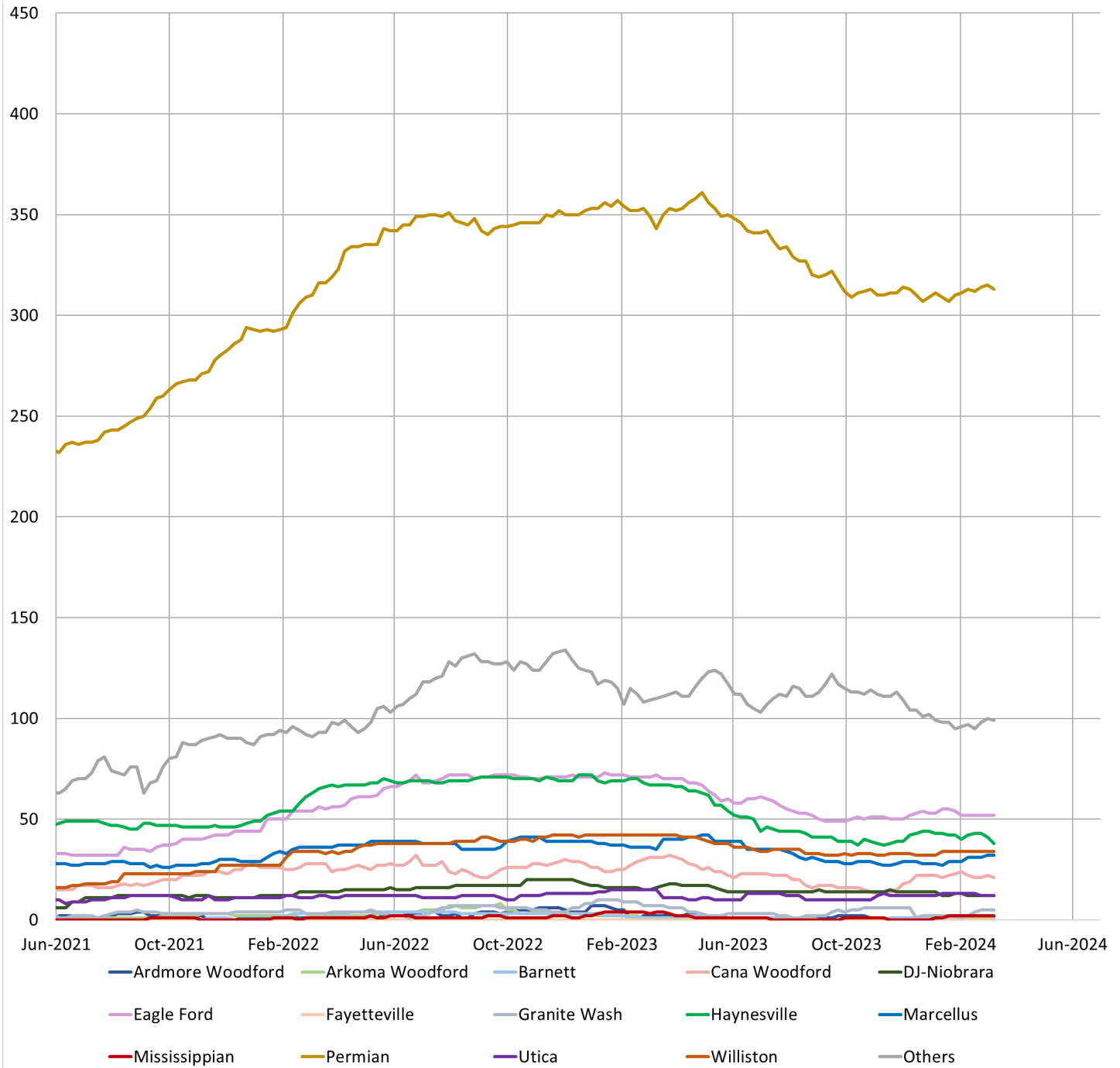
## DEAL VALUE BY US REGION (BY YEAR)



\*Source—PLS M&A Database (Charts exclude terminated deals)



## RIG ACTIVITY BY US REGION

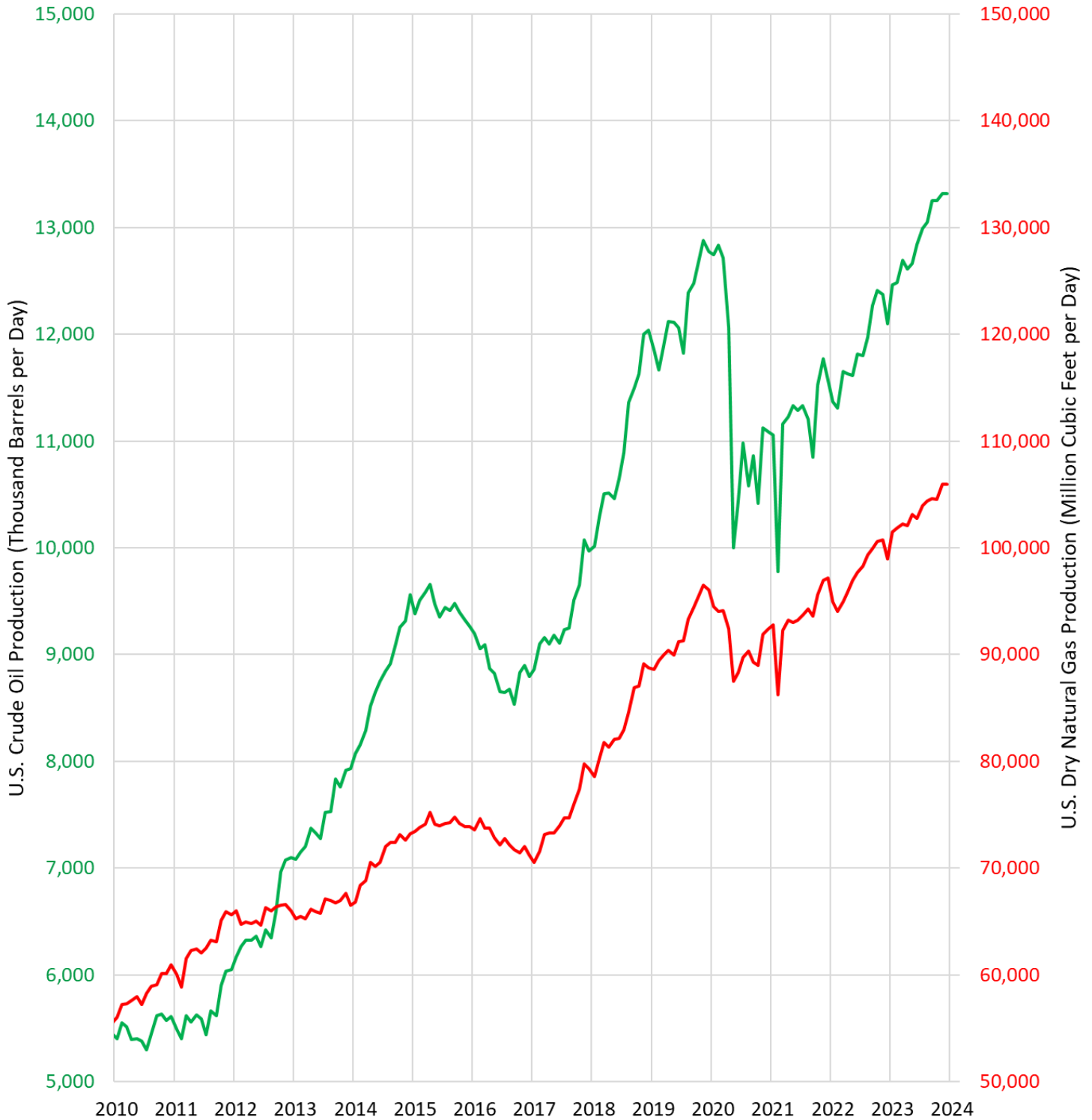


\*Source—Baker Hughes Weekly Rig Counts





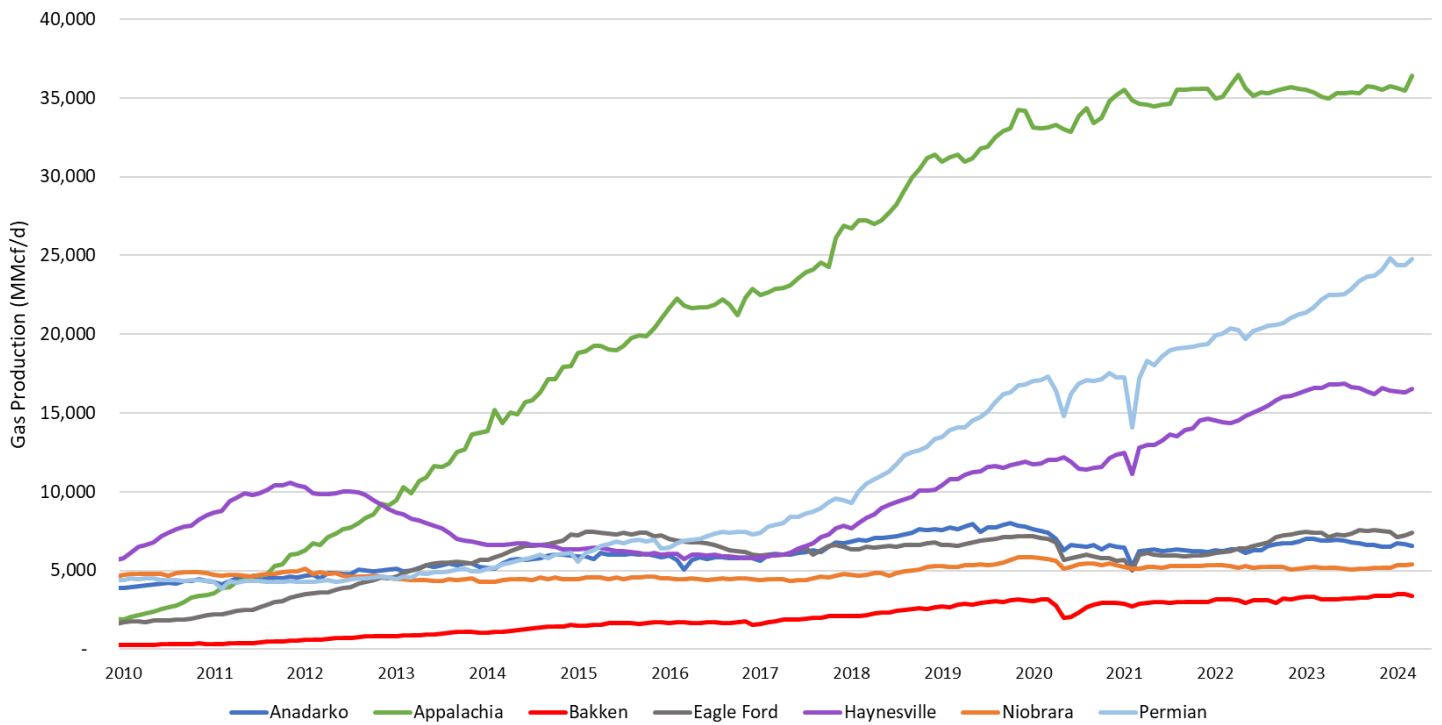
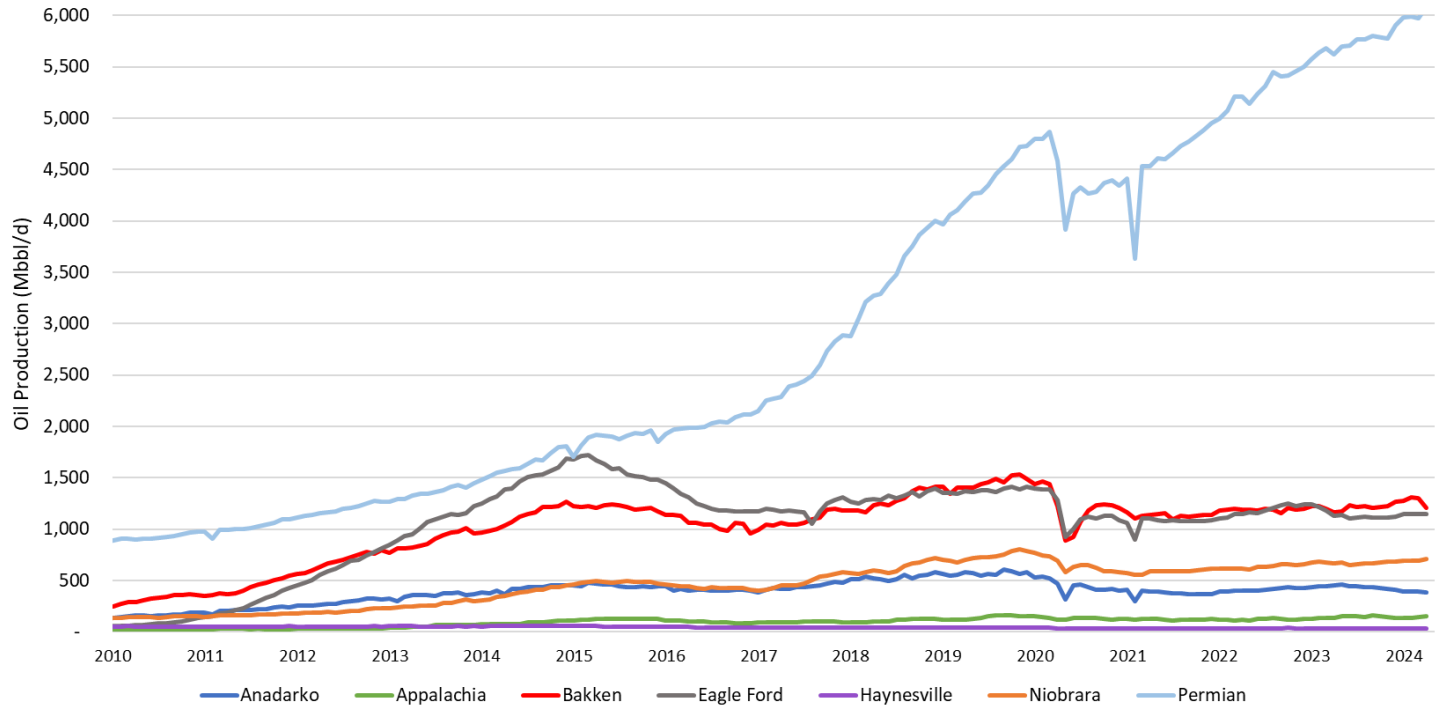
**US DAILY CRUDE (MMbbl) & DRY NATURAL GAS PRODUCTION (MMcf)**



\*Source—Energy Information Administration, United States (EIA)



## HISTORICAL PRODUCTION OF SELECTED US SHALE REGIONS



\*Source—Energy Information Administration, United States (EIA)



## **UPCOMING EVENTS**

### **March 2024**

[OneGoal Pathways of Promise Luncheon](#)

March 20

Houston, TX

[ROCC US Men's Clay Court Championship](#)

March 30 - April 7

Houston, TX

### **April 2024**

[World Oilman's Poker Tournament \(WOPT\)](#)

April 3-5

Las Vegas, NV

[The Leukemia & Lymphoma Society \(LLS\) Big Climb](#)

April 6

Houston, TX

[HBA & HPF Spring Social](#)

April 11

Houston, TX

[World Oilman's Mineral & Royalty Conference \(MARC\)](#)

April 15-16

Houston, TX

[Quorum Qnections Conference](#)

April 23-25

Las Vegas, NV

[HPF/SPE Fifth Annual Crawfish Boil](#)

April 24

Houston, TX

[World Oilman's Tennis Tournament \(WOTT\)](#)

April 24-27

Houston, TX

[ADAM Energy Golf Tournament](#)

April 29

Frisco, TX

\*Denotes an Opportune Sponsored Event



## **ABOUT RALPH E. DAVIS ASSOCIATES**

**Ralph E. Davis Associates LLC (RED)** is an industry-leading petroleum engineering and geosciences firm committed to satisfying the individual needs of clients. We accomplish this by holding ourselves to the highest standards of integrity and professionalism to deliver honest, direct and actionable insights to help clients achieve their strategic objectives. We distinguish ourselves by combining reservoir engineering, geoscience evaluation techniques and advanced data analytics with economic analyses to provide our clients with individual, customized solutions.

Banks, bondholders, private equity firms, financial institutions and law firms around the world trust in RED's diverse services and unrivaled upstream oil and gas expertise to deliver comprehensive solutions that help clients make informed decisions. We add value to every engagement by employing a team approach, leveraging Opportune LLP's experienced bench of experts in transactional due diligence, tax advisory, investment banking, restructuring and valuation.

We offer technical and economic analyses to deliver our clients a complete, independent, accurate and detailed assessment of the value of their assets. We apply a robust set of technical capabilities to assist our clients. Our capabilities include:

- Reservoir engineering and geosciences
- Economic forecasting and reporting
- Data analytics and geospatial analysis

## **KEY CONTACTS**



**Steve Hendrickson** is the President of Ralph E. Davis Associates, an Opportune LLP company. Steve has over 35 years of professional leadership experience in the energy industry with a proven track record of adding value through acquisitions, development and operations. Steve is a licensed professional engineer in the state of Texas, and holds an M.S. in Finance from the University of Houston and a B.S. in Chemical Engineering from The University of Texas at Austin. He recently served as a board member of the Society of Petroleum Evaluation Engineers (SPEE) and is a registered FINRA representative.



**John Beaird** is Vice President of Ralph E. Davis Associates, an Opportune LLP company. John has 39 years of oil and gas management, reservoir engineering, and petroleum economics evaluation experience. Recent relevant experience includes the Permian, Western Gulf, Tx-La-Miss Salt, Mid-Continent, Denver-Julesburg, Wind River, Williston Basin, and Appalachian Basins. John is a registered Petroleum Engineer in the State of Texas and holds a B.S. in Petroleum Engineering from Louisiana Tech University. He is also an active member of the Society of Petroleum Evaluation Engineers (SPEE).



David Edwards is a Petroleum Engineer at Ralph E. Davis Associates, an Opportune LLP company. David has over three years of reserves engineering experience in conventional and unconventional reservoirs. Before RED, David was a Petroleum Engineer at a lower middle market A&D advisory firm where he handled the technical processes for marketed assets. He began his career with an operator in Dallas, where he contributed to its engineering, operations, and A&D teams. David holds an M.B.A. from The University of Texas Permian Basin and a B.S. in Petroleum Engineering from The University of Oklahoma.

