



Weekly E&P Update

February 6, 2024

Vol. 6

Advancements in Unconventional EOR: Shaping the Future of Oil and Gas Development

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A consistent pattern emerges when we reflect on the evolution of the oil and gas industry, especially in terms of technological advancements. New plays are initially conceptualized and explored, and once successful ones are identified, they progress from primary recovery methods, typically depletion, to more sophisticated and costly approaches such as water-flooding, CO2 floods, and occasionally more unconventional techniques like surfactant flooding to extract remaining resources.

The shale revolution has introduced a new realm of unconventional plays that have transitioned from discovery and delineation to full-scale development. However, operators are now exploring technologies to maximize these wells' recoveries by intervening with enhanced oil recovery (EOR) techniques earlier in their lives. However, due to unconventional reservoirs' ultra-low permeability, traditional displacement methods that force oil toward offset production wells are not applicable to these reservoirs.

In the latest edition of the Society of Petroleum Engineers' [Journal of Petroleum Technology](#), Stephen Rassenfoss presents an [insightful update](#) on the status of enhanced oil recovery (EOR) applications in unconventional oil reservoirs, focusing mainly on Chevron's research. Chevron and other industry leaders are currently prioritizing two main types of EOR techniques: gas injection and the injection of water containing surfactants. Both methods employ a "huff-and-puff" approach, wherein fluids are injected into a production well and then temporarily shut-in for an extended period, usually a few weeks, before resuming production. I think these methods could be better described as "stimulation treatments"; nevertheless, they exhibit EOR attributes.

The initial deployment of the gas injection technology in unconventional reservoirs can be traced back to EOG's efforts several years ago in their Eagle Ford shale assets. EOG injected gas at high pressure, achieving miscibility with the oil. At these pressures, the gas thoroughly mixes with the oil, reducing viscosity and enhancing flow through the reservoir. While this approach yields the most significant EOR response, it also comes with higher costs due to the elevated pressures involved. Lower pressures below the miscibility threshold are more cost-effective but yield lower incremental reserves. Gas migration is another challenge, with a significant portion of gas escaping. In plays with multiple benches, strategies are being devised to mitigate this challenge by co-stimulating the shallower producers with injection in the deeper zones.

Another compelling technology involves the use of surfactant-water mixtures. Rassenfoss highlights a paper ([URTEC-3870505-MS](#)) that outlines Chevron's success with a proprietary treatment in the Permian Basin. A noteworthy aspect of this approach is its versatility, as fluids can be tailored not only to realize EOR benefits in the reservoir, such as reduced interfacial tension and altered rock wettability, but also to remediate damage in fractures. In a case study, a well subject to this treatment saw a remarkable incremental recovery of 36,000 barrels during the first year of production after the treatment, exceeding production rates anticipated from pre-treatment decline curve analysis.

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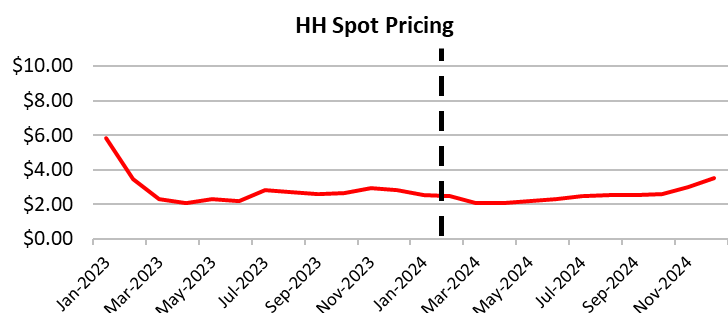
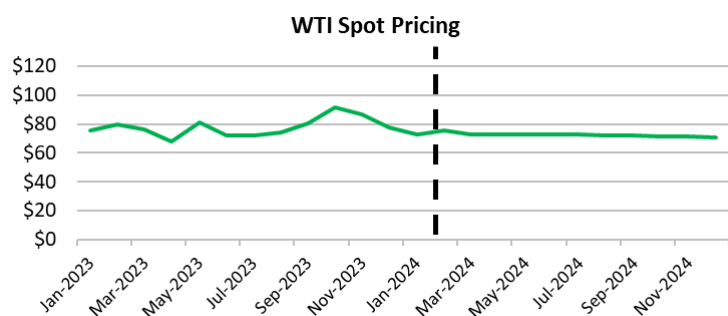
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NYMEX FUTURE PRICING



MONDAY'S MARKET CLOSE

NYMEX WTI CRUDE OIL FUTURES as of February 05, 2024 Close (\$/bbl)

Period	Current	WoW Change	Last Week	1 Yr Ago
2024	\$72.17	(\$3.35)	\$75.52	\$69.90
2025	\$68.77	(\$2.39)	\$71.16	\$66.50
2026	\$65.92	(\$1.92)	\$67.84	\$63.55
2027	\$64.23	(\$1.45)	\$65.68	\$60.94
2028	\$63.44	(\$1.01)	\$64.45	\$58.50

NYMEX HH NATURAL GAS FUTURES as of February 05, 2024 Close (\$/MMBtu)

Period	Current	WoW Change	Last Week	1 Yr Ago
2024	\$2.53	(\$0.02)	\$2.55	\$3.63
2025	\$3.43	\$0.00	\$3.43	\$3.89
2026	\$3.76	\$0.02	\$3.74	\$3.98
2027	\$3.78	\$0.03	\$3.75	\$3.98
2028	\$3.76	\$0.05	\$3.71	\$4.02

INDUSTRY METRICS—QUICK SNAPSHOT

	Current	Last Week	WoW Change	%Change
Crude Oil Near-Month Price (\$/bbl)	\$72.76	\$78.90	(\$6.14)	(8%)
Natural Gas Near-Month Price (\$/MMBtu)	\$2.07	\$2.68	(\$0.61)	(23%)
Weekly Upstream-Deal Transaction Value (\$MM)	\$175.85	\$0.00	\$175.85	-
Weekly Number of Upstream-Deal Transactions	5	0	5	-
Current Total US Rig Count	619	621	(2)	(0.3%)
US Field Crude Oil Production (MMbbl/day)	13.0	12.3	0.7	6%
US Field Dry Natural Gas Production (Bcf/day)	109.3	108.1	1	1%
Commercial Crude Oil Stocks-Excluding SPR (MMbbl)	422	421	1	0.3%
Natural Gas Stocks-Working Gas Underground Storage (Bcf)	2,659	2,856	(197)	(7%)
Total Drilled But Uncompleted Wells (DUC-Last Month)	4,374	4,374	0	-

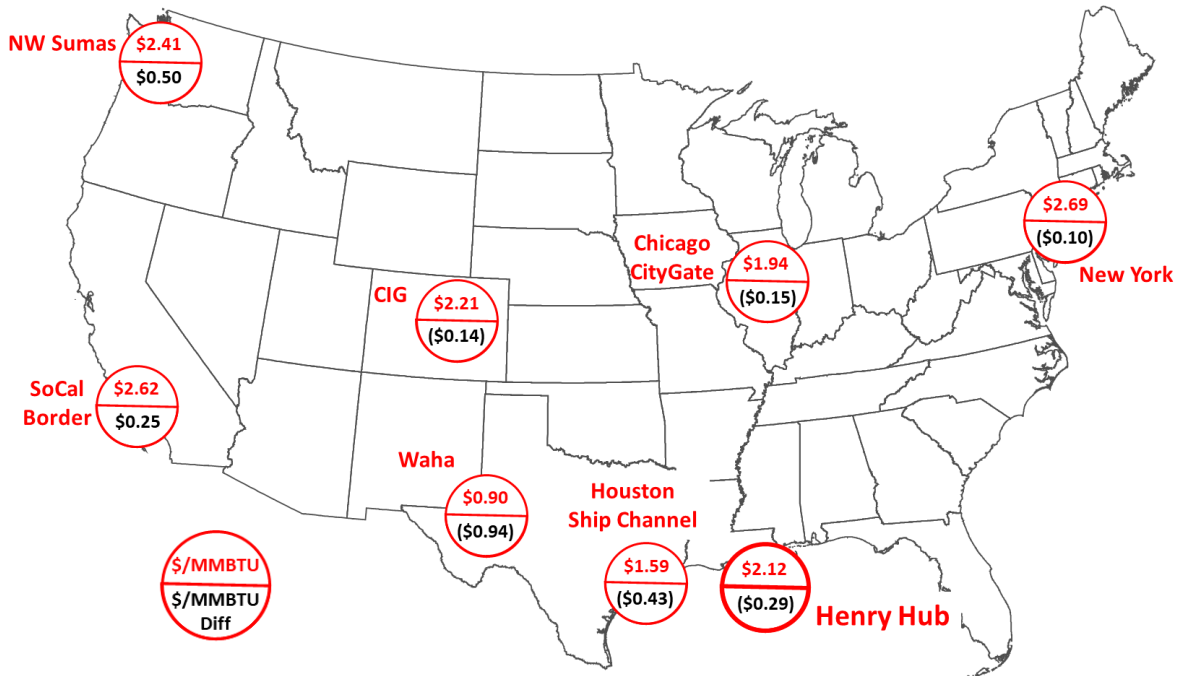
*Source—Energy Information Administration, United States (EIA)

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

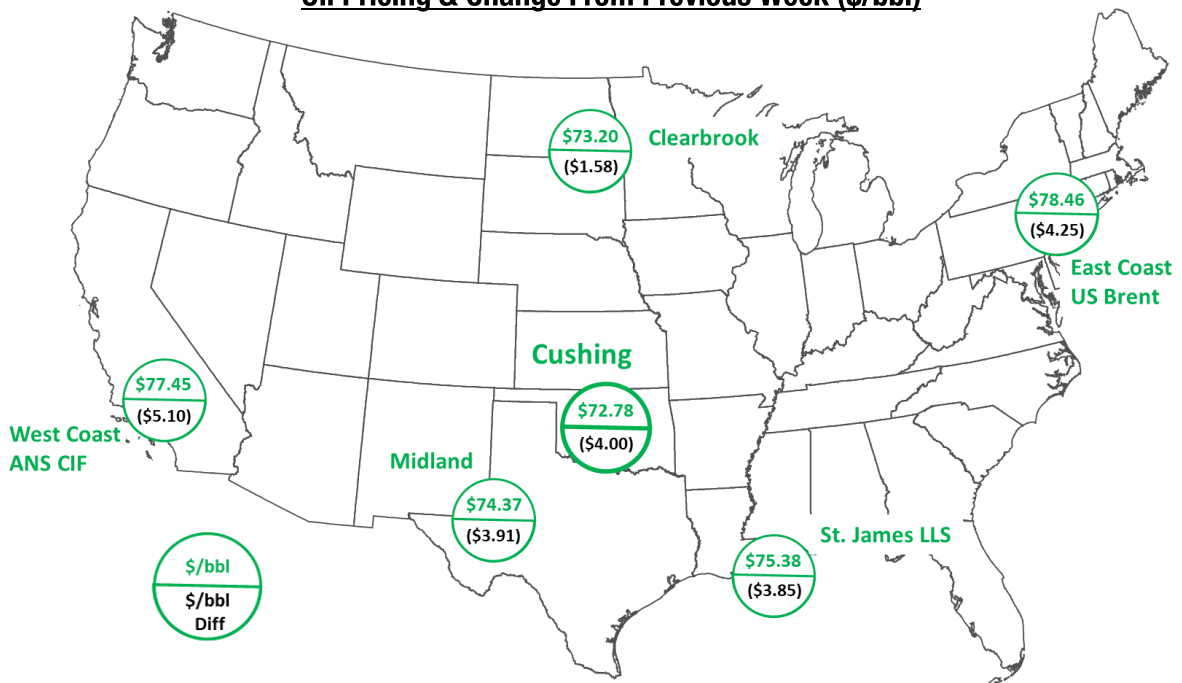


US COMMODITY PRICES CONTINUED

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



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



*Source—Bloomberg LP



SELECTED INDUSTRY HEADLINES

US Oil, Gas Drillers Take Their Foot Off The Gas

The total number of active drilling rigs for oil and gas in the United States fell this week, according to new data that Baker Hughes published on Friday.

USA Crude Oil Inventories Increase

U.S. commercial crude oil inventories, excluding those in the Strategic Petroleum Reserve (SPR), increased by 1.2 million barrels from the week ending January 19 to the week ending January 26.

Oil Market Will Face Supply Shortage by End of 2025, Occidental CEO Says

The oil market will face a supply shortage by the end of 2025 as the world fails to replace current crude reserves fast enough, Occidental CEO Vicki Hollub told CNBC on Monday.

Booming Shale Production Lifts Exxon, Chevron Forecasts as Oil and Gas Earning Season Kicks Off

Exxon Mobil Corp. and Chevron Corp. surpassed earnings forecasts as bigger-than-expected oil output from shale fields helped cushion the blow from weakening crude prices.

Oil Steady as Rate Cut Caution Overshadows Mideast Strikes

Oil prices were steady on Monday as a strong U.S. job report which curbed sharp falls last week dampened hopes of swift rate cuts, but a U.S. pledge to continue air strikes in the Middle East kept geopolitical tensions high.

Oil Prices Fall as Fed Moves Carefully on Rate Cuts, U.S. Pushes for Pause in Gaza War

Oil prices fell Monday as the Federal Reserve moves carefully on interest rate cuts, and the U.S. pushes for an extended pause in the Israel-Hamas War.

How the U.S. Became the World's Biggest Gas Supplier (LOGIN CREDENTIALS REQUIRED)

In just eight years, the United States has rocketed from barely selling any gas overseas to becoming the world's No. 1 supplier, a remarkable shift that has profited oil and gas companies and strengthened American influence abroad.

Natural Gas Futures Ease Lower Early Amid Near-Term Warmth, Production Strength (LOGIN CREDENTIALS REQUIRED)

With the prospect of a colder back half of February countered by mild weather and continued production strength in the interim, natural gas futures probed both sides of even early Monday.

U.S. Natural Gas Consumption Established A New Daily Record in January 2024

On January 16, 2024, a record high of 141.5 billion cubic feet of natural gas was consumed in the U.S. Lower 48 states, exceeding the previous record set on December 23, 2022.

US Says Allies 'Reassured' LNG Pause Does Not Affect Current Exports

U.S. allies concerned about steady supplies of liquefied natural gas (LNG) are reassured when they understand President Joe Biden's pause on LNG export approvals does not affect currently permitted shipments, a U.S. State Department official said on Monday.

Associations Urge Legislative Action to Counter Biden LNG Move

In a release sent to Rigzone recently, the Independent Petroleum Association of America (IPAA) revealed that it had joined several trade associations "in urging Congress to take immediate legislative action to counter the Biden Administration's recent decision to halt LNG permits".

BKV CEO: If You Have the Skills To Pay the Bills, CCS is a 'Tremendous Business'

Shale gas producer BKV Corp. has made the leap into the US CCS sector, becoming the latest upstream firm to challenge the idea that only industry giants can make significant moves in this emerging arena.



SELECTED RECENT TRANSACTIONS

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.

Prairie Operating Expands With \$94.5 Million Asset Acquisition

Prairie Operating Co., an oil and gas company, has announced a definitive agreement to acquire the assets of Nickel Road Operating LLC for a total consideration of \$94.5 million.

Chesapeake Energy Merges With Southwestern For \$7.4 Billion—Becomes Largest Natural Gas Producer In U.S.

Chesapeake Energy will merge with Southwestern Energy in an all-stock deal valued at \$7.4 billion, both companies announced Thursday, the latest transaction in the energy industry that would make Chesapeake the largest natural gas producer in the U.S.

U.S. Energy Corp. Announces Completion of Asset Divestitures and Provides Liquidity Update

U.S. Energy Corp, a growth-focused energy company engaged in the operation of high-quality producing oil and natural gas assets, today announced it had completed a series of non-core asset divestitures.

Evolution Petroleum Announces Acquisition of Non-operated Oil and Gas Assets

Evolution Petroleum Corporation announced that it has entered into definitive agreements to acquire non-operated oil and natural gas assets in the SCOOP and STACK plays in central Oklahoma for \$43.5 million in cash.

Trio Petroleum Announces an Option to Acquire a 20% Interest in the Asphalt Ridge Development Project in Utah

Trio Petroleum Corp, a California-based oil and gas company, announced that it has secured an option to acquire a 20% interest in a sweet, heavy-oil development project at Asphalt Ridge, located near the town of Vernal in Uinta County in northeastern Utah.

APA Corp to Buy Callon Petroleum in \$4.5 Billion All-Stock Deal

Callon Petroleum +6% pre-market recently after APA Corp. agreed to acquire the company in an all-stock deal valued at ~\$4.5B including debt, boosting its presence in the Permian Basin.

Ellipsis U.S. Onshore Acquires Oil, Gas Assets in U.S. Permian, DJ, Salt Basins

Ellipsis U.S. Onshore Holdings LLC has acquired additional assets located in multiple basins onshore the U.S.

Vital Energy Makes \$55 Million of Acquisitions in Permian Basin

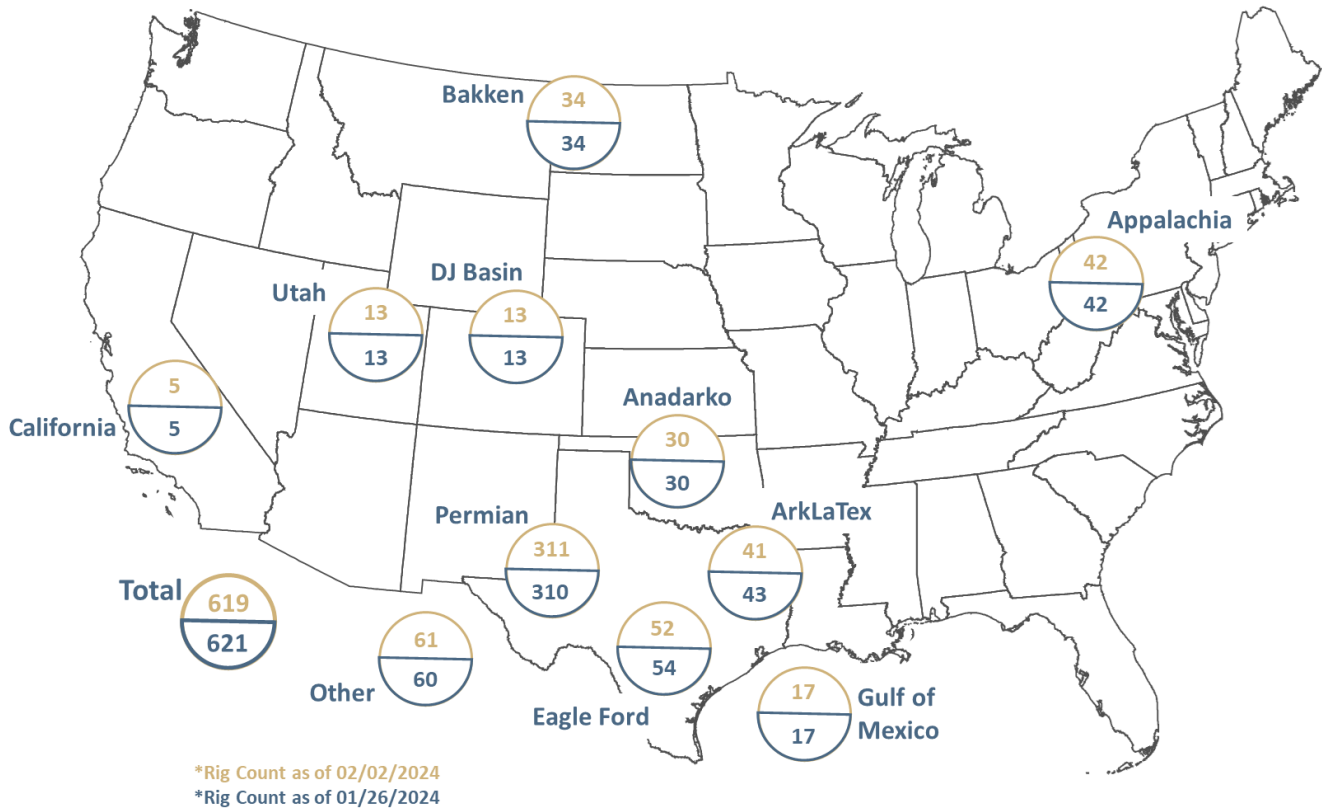
Tulsa's Vital Energy Inc. is expanding its Permian Basin holdings with a \$55 million acquisition of additional working interests from Permian Basin operator Henry Energy LP, Moriah Henry Partners LLC and Henry Resources LLC.

Westlawn Group Announces Company Formation and the Closing of Multiple Investments in the Gulf of Mexico

Westlawn Group announced the successful launch of Westlawn Americas Offshore following the acquisition of multiple assets across deepwater Gulf of Mexico with current production in excess of 10,000 BOEPD and multiple near-term growth opportunities.



RIG ACTIVITY BY US REGION

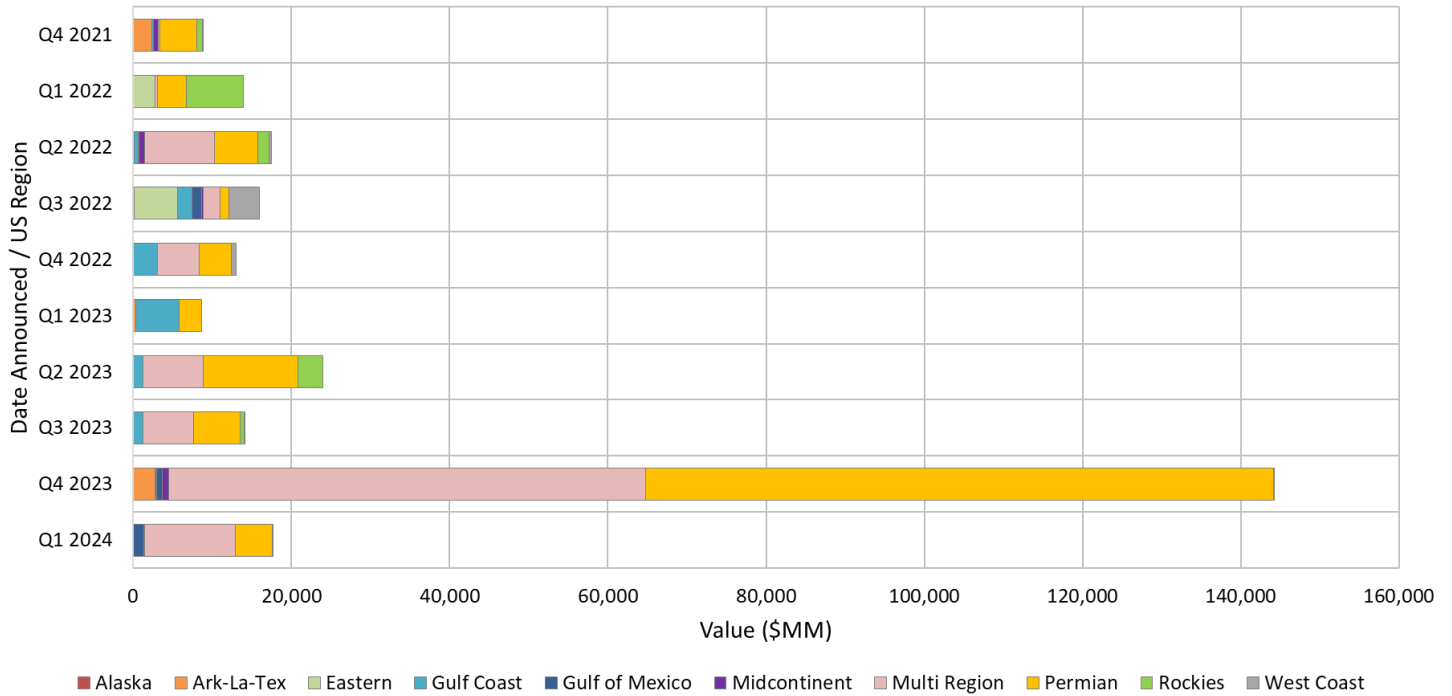


	Week Ending 02/02/2024			Week Ending 01/26/2024		Week Ending 02/03/2023
U.S. Rig Breakouts	Count	+/-	Count	+/-	Count	
Oil	499	0	499	(100)	599	
Gas	117	(2)	119	(41)	158	
Not Specified	3	0	3	1	2	
Directional	49	0	49	11	38	
Horizontal	558	(1)	559	(142)	700	
Vertical	12	(1)	13	(9)	21	
Land (Inc Others)	600	(2)	602	(145)	745	
Inland Waters	0	0	0	(2)	2	
Offshore	19	0	19	7	12	
US Total	619	(2)	621	(140)	759	

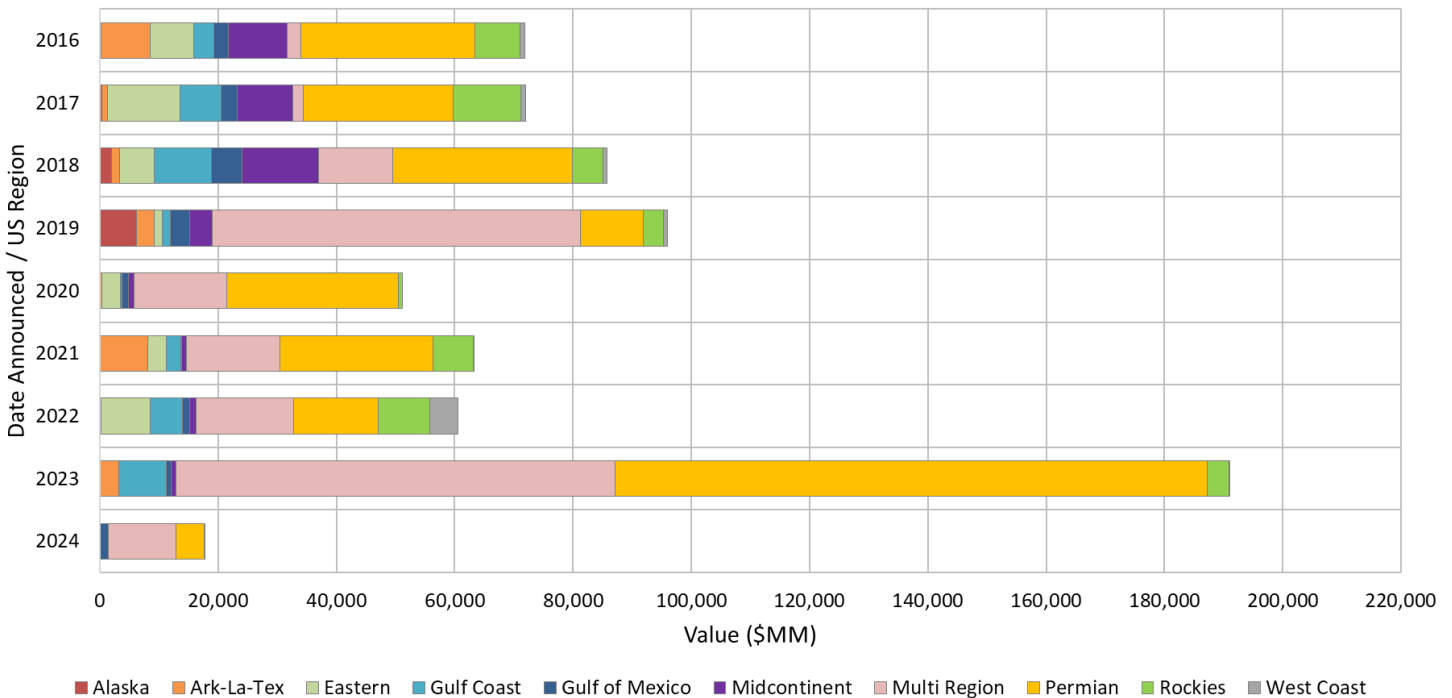
*Source—Baker Hughes Weekly Rig Counts



DEAL VALUE BY US REGION (BY QUARTER)



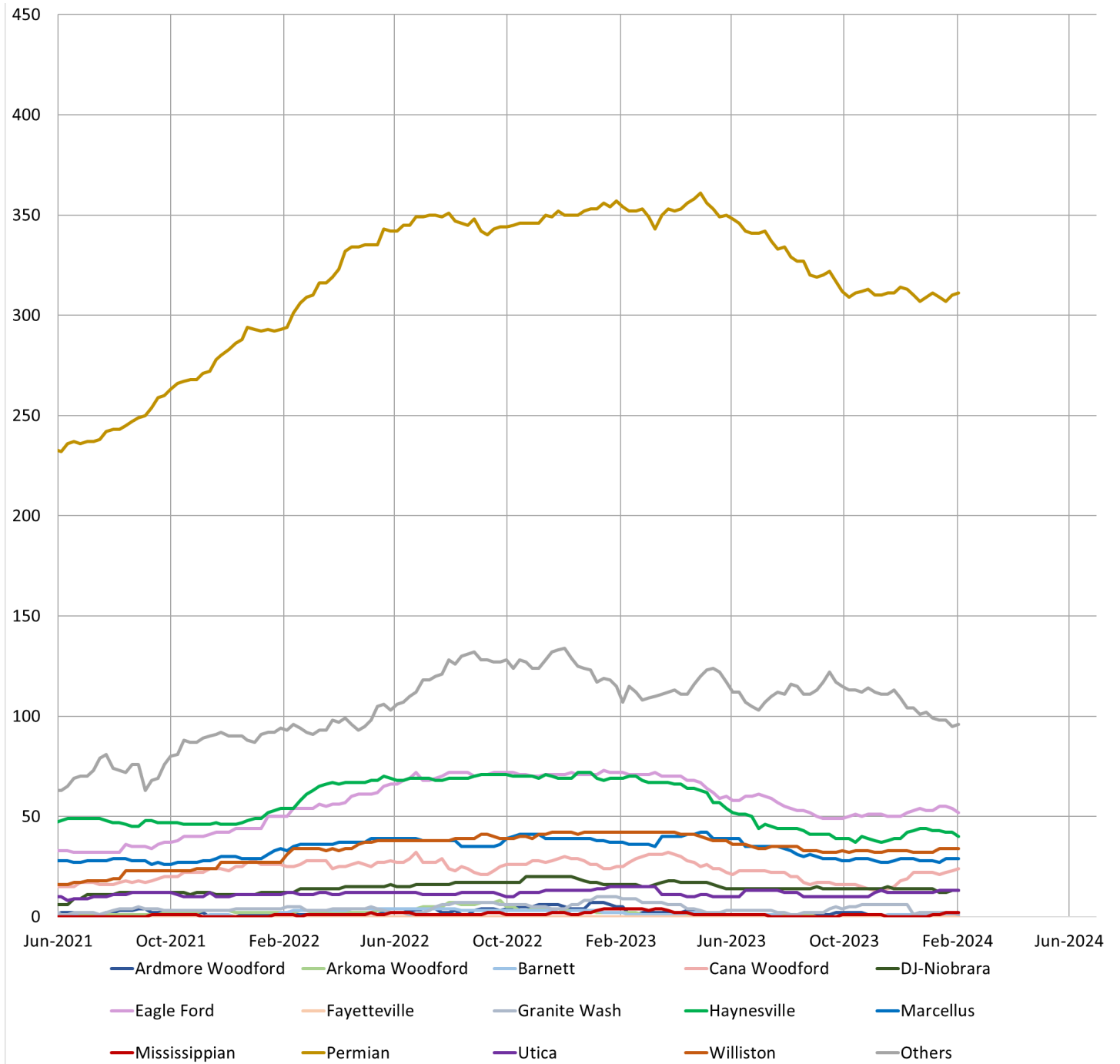
DEAL VALUE BY US REGION (BY YEAR)



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



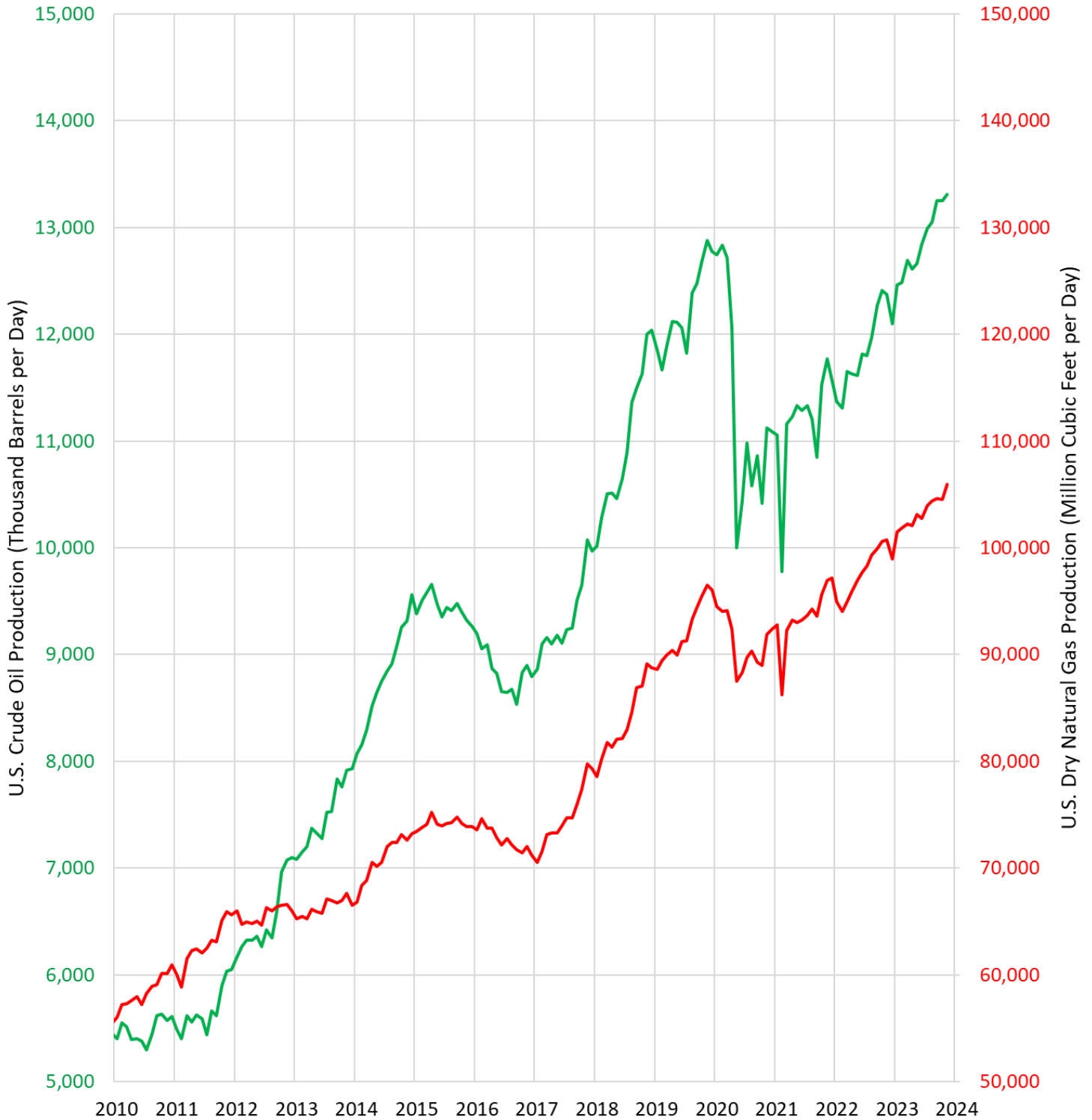
RIG ACTIVITY BY US REGION



*Source—Baker Hughes Weekly Rig Counts



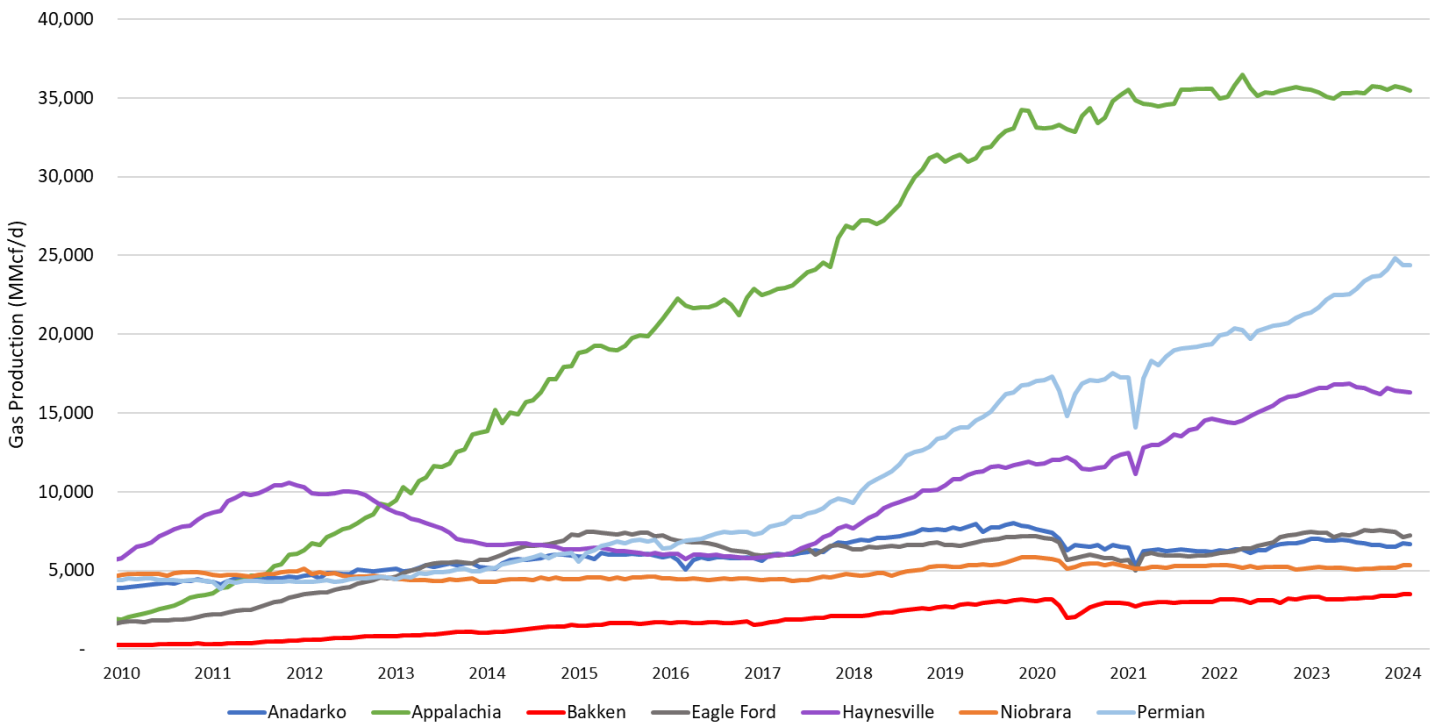
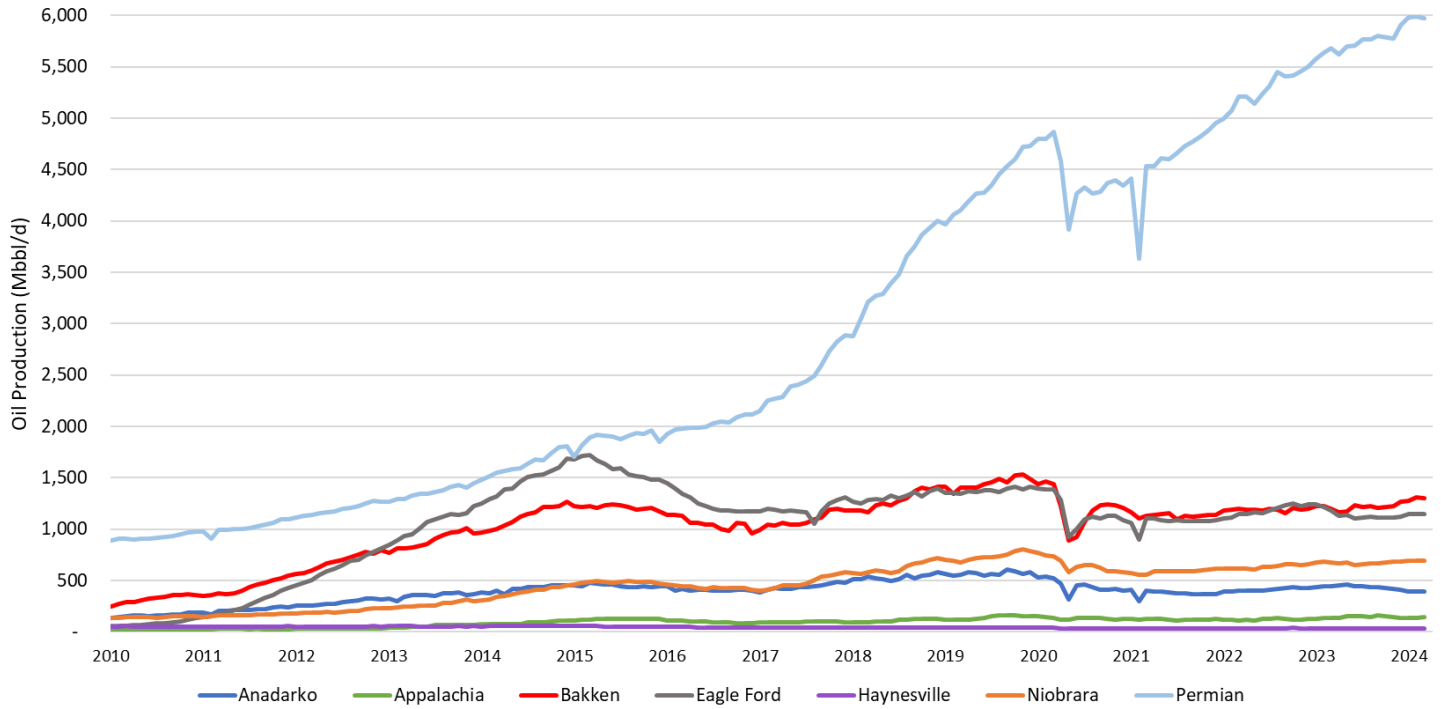
US DAILY CRUDE (MMbbl) & DRY NATURAL GAS PRODUCTION (MMcf)



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



HISTORICAL PRODUCTION OF SELECTED US SHALE REGIONS



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



UPCOMING EVENTS

February 2024

NAPE Summit	February 7-9	Houston, TX
SPE Business Development A&D Symposium	February 28	Houston, TX

March 2024

Big Energy! Gala 2024	March 2	Houston, TX
5th Circuit Bankruptcy Bench-Bar Conference	March 6-8	New Orleans, LA
Tulsa Irish Festival	March 8-10	Tulsa, OK
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
World Oilman's Tennis Tournament (WOTT)	April 24-27	Houston, 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).



Yvonne Trujillo is a Senior Petroleum Engineer at Ralph E. Davis Associates, an Opportune LLP company. Yvonne has over 25 years experience in the oil and gas industry with extensive expertise in reserves engineering, SEC and PRMS/SPE reporting and economics and asset evaluation in conventional and unconventional reservoirs in the U.S. Lower 48. Yvonne earned a B.S. in Mechanical Engineering at Simon Bolivar University in Caracas, Venezuela and an M.S. in Petroleum Engineering at the University of Houston.



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.

