



Weekly E&P Update

October 24, 2023

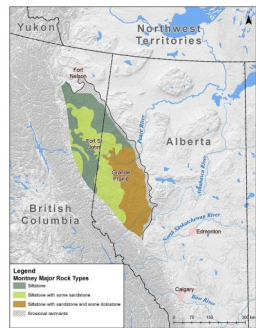
Vol. 42

Montney Shale Horizontal Development Overview

By Steve Hendrickson
President of Ralph E. Davis Associates



The **Montney Shale** is a predominantly gas-producing formation that occurs over a large region of western Canada that was deposited during the early Triassic Period approximately 250 million years ago. It is a complex reservoir with various rock types and **somewhat unpredictable liquid content**. Canada is the world's fifth largest producer of natural gas (around 17 bcf/day), although it produces substantially less than the top two producers (the US and Russia), which each produce about 100 bcf/day). Canada's production is **forecast to grow to over 21 bcf/d** by 2030, and the Montney Shale is expected to provide much of this growth. This week, we will quickly examine its characteristics and development history.



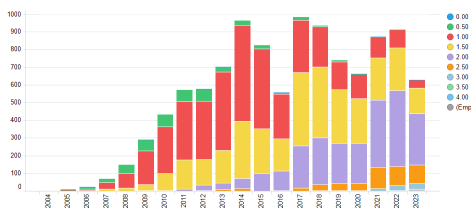
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(Source: Girrodriguezp)

The Montney formation shares many common attributes with the leading shale gas plays in the US, including a thick section, good organic content, and slight overpressures. Gas in place per section is comparable to the Haynesville.

The horizontal development of the play started in 2005, and approximately 10,000 wells have been drilled with nominal lateral lengths of 0.5 miles. As with most horizontal plays, the early wells tended to have 1.0 mile laterals, but these have gradually increased to most wells being 2 mile laterals with significant numbers up to 2.5 miles. In 2022, approximately 900 new wells were placed on production. Most development has been on 2 to 4 wells per section spacing. The average proppant intensity was initially less than 1000 lbs/ft, but has increased and stabilized around 1200.

	Montney	Barnett	Haynesville	Marcellus
Depth (ft)	6,500 - 11,000	6,500 - 8,500	11,000 - 13,000	4,000 - 8,000
Gross Thickness (ft)	1,000 - 1,400	150 - 700	1200 - 1300	50 - 300
Net Thickness (ft)	450 - 525	100 - 600	200 - 350	50 - 250
Thermal Maturity Ro%	2.2 - 3.8	0.8 - 1.3	1.8-2.5	0.7 - 2.15
TOC, %	1.0-5.0%	4.5	0.5 - 4%	1.0 - 5.0%
Silica Content	45 - 60%	35 - 50%	30%	20 - 60%
Clay Content	< 35%	33%	20 - 35%	
Total Porosity, %	2.0 - 4.5	4.5	8 - 15%	1.6 - 7.0
Permeability (mD)	250 - 450			
Gas-In-Place, BCF/Section	130 - 320	50 to 150	200 to 250	40 - 130
Pressure Gradient (psi/ft)	0.65	0.46 - 0.50	Over pressured	0.45 - 0.60
EUR per well		2.65 BCF	6.5 BCF	

[CLICK TO ENLARGE](#)
(Source: shaleexperts.com)



[CLICK TO ENLARGE](#)
(Source: Enverus)

The formation is considered a "hybrid" play that is a mixture of unconventional to almost conventional rock types, and the resulting variation in permeability leads to differences in production performance. Some wells produce like unconventional wells with high initial declines and b-factors, while others exhibit nearly exponential decline. A quick EUR analysis of a couple thousand wells drilled in the last few years shows an average EUR/1000 feet of lateral of almost 1.0 bcf, but the EUR distribution is quite wide with a P10/P90 ratio of over 9. This wide range of EURs reflects the variation in reservoir and fluid properties over the large play area. In addition to a large areal extent, the thickness of the formation leads to vertical variation, as well. The formation is subdivided into multiple members, and the Upper Montney A & B performs much better than the others, on average.

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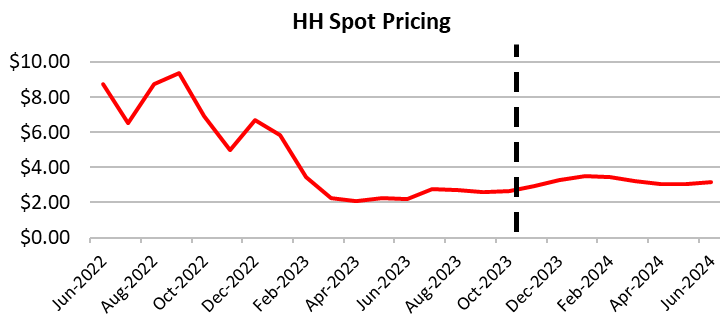
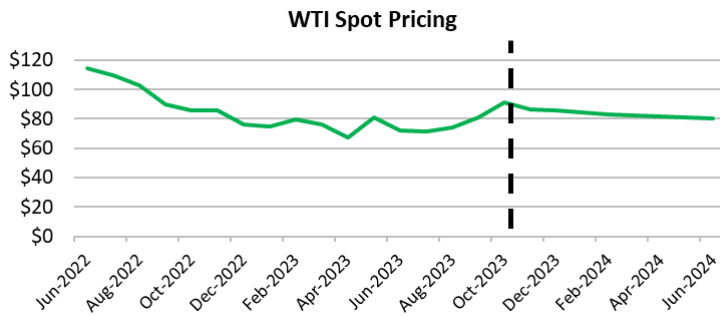
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NYMEX FUTURE PRICING



MONDAY'S MARKET CLOSE

NYMEX WTI CRUDE OIL FUTURES as of October 23, 2023 Close (\$/bbl)

Period	Current	WoW Change	Last Week	1 Yr Ago
2023	\$85.49	(\$0.47)	\$85.96	\$78.69
2024	\$80.44	\$0.26	\$80.18	\$72.23
2025	\$74.75	(\$0.29)	\$75.04	\$68.41
2026	\$70.88	(\$0.54)	\$71.42	\$65.73
2027	\$67.90	(\$0.70)	\$68.60	\$63.49

NYMEX HH NATURAL GAS FUTURES as of October 23, 2023 Close (\$/MMBtu)

Period	Current	WoW Change	Last Week	1 Yr Ago
2023	\$3.10	(\$0.19)	\$3.29	\$4.89
2024	\$3.40	(\$0.15)	\$3.55	\$4.51
2025	\$4.03	(\$0.03)	\$4.06	\$4.38
2026	\$4.08	\$0.02	\$4.06	\$4.32
2027	\$4.02	\$0.03	\$3.99	\$4.30

INDUSTRY METRICS—QUICK SNAPSHOT

	Current	Last Week	WoW Change	%Change
Crude Oil Near-Month Price (\$/bbl)	\$88.00	\$87.06	\$0.94	1%
Natural Gas Near-Month Price (\$/MMBtu)	\$2.91	\$3.12	(\$0.22)	(7%)
Weekly Upstream-Deal Transaction Value (\$MM)	\$6.00	\$64,500.00	(\$64,494.00)	(100%)
Weekly Number of Upstream-Deal Transactions	4	3	1	33%
Current Total US Rig Count	624	622	2	0.3%
US Field Crude Oil Production (MMbbl/day)	13.2	13.2	0	-
US Field Dry Natural Gas Production (Bcf/day)	108.1	106.9	1.2	1%
Commercial Crude Oil Stocks-Excluding SPR (MMbbl)	420	424	(4)	(1%)
Natural Gas Stocks-Working Gas Underground Storage (Bcf)	3,626	3,529	97	3%
Total Drilled But Uncompleted Wells (DUC-Last Month)	4,681	4,749	(68)	(1.4%)

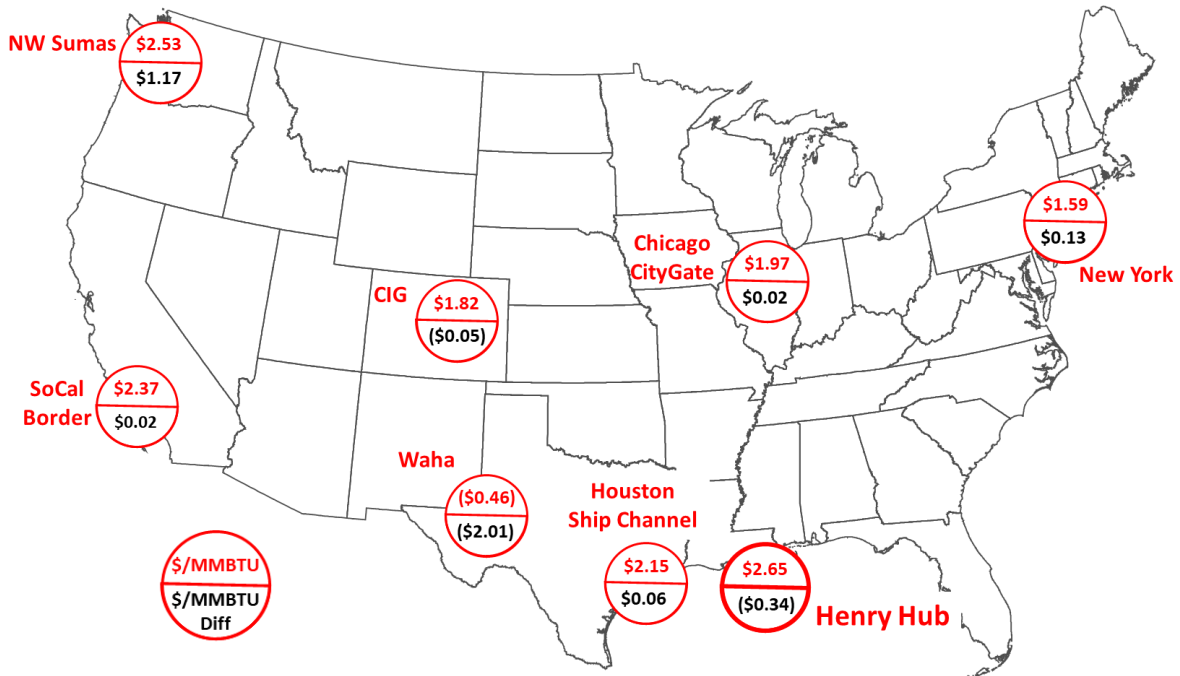
*Source—Energy Information Administration, United States (EIA)

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

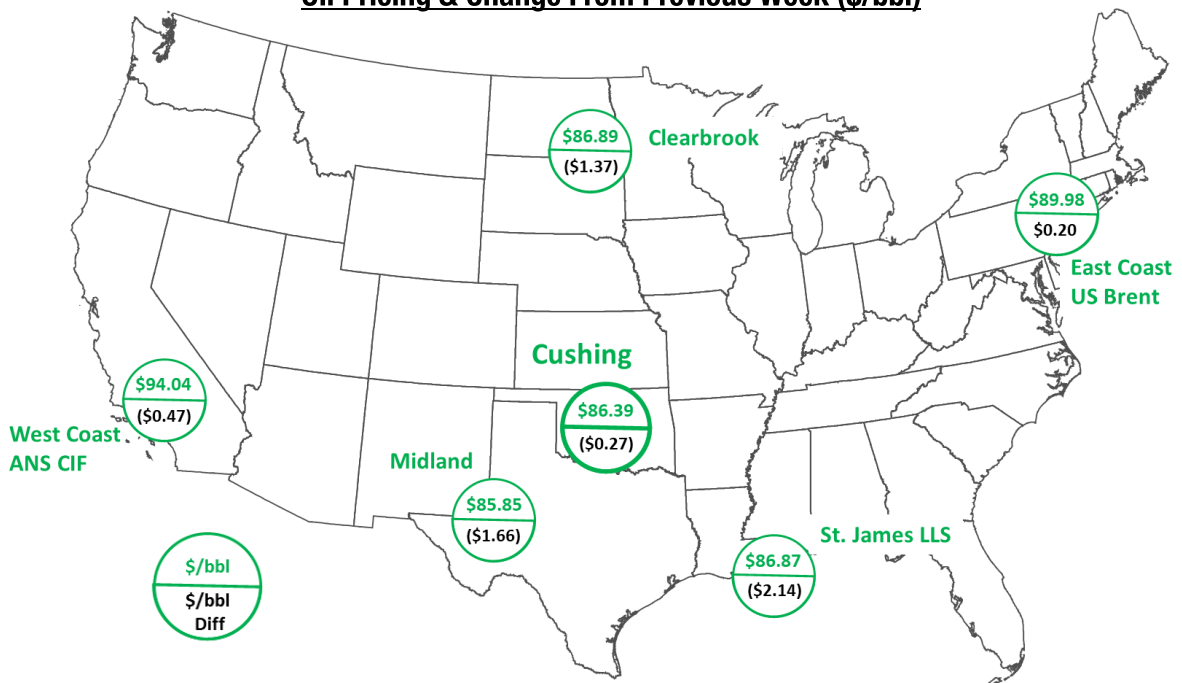


US COMMODITY PRICES CONTINUED

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



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



*Source—Bloomberg LP



SELECTED INDUSTRY HEADLINES

Texas Sees Host of Oil and Gas Records

Texas has seen a host of oil and gas related records recently, the Texas Oil & Gas Association's (TXOGA) latest monthly energy economic analysis, which is prepared by the organization's Chief Economist Dean Foreman, pointed out.

Rising Interest Rates Pose Challenges For Gold And Oil

Precious metals like gold and silver are often seen as a safe haven asset during times of economic uncertainty.

Oil Drops Over 2% as Diplomatic Moves in Gaza War Ease Supply Concerns

Oil prices fell over 2% on Monday as diplomatic efforts in the Middle East intensified in an attempt to contain the conflict between Israel and Hamas, easing investor concerns about potential supply disruptions.

Oil Prices Forecast: Weaker Amid Israel-Hamas Diplomacy, Eased Supply Concerns

Diplomatic strides in the Israel-Hamas conflict, US sanctions relief on Venezuela ease crude oil supply strains; China cuts back on costly imports.

Strategists Flag Short Term Upward Oil Price Risk

In an oil and gas report sent to Rigzone late last week, Macquarie strategists flagged a "short term upward price risk" but revealed that they maintained a medium-term bearish view, despite the Middle East conflict.

Analysts: Chesapeake-Southwestern Deal Could Create Top US Shale Gas E&P

A merger between Chesapeake Energy Corp. and Southwestern Energy Co. would create the nation's largest natural gas E&P, analysts say. But a multibillion-dollar combination could also draw scrutiny from regulators.

New Natural Gas Investments Are Crucial To Prevent Price Shocks

Unprecedented uncertainty in natural gas demand and policies and low levels of investment in new production risk creating fresh energy crises and undermining energy security and climate goals as it would stall the move away from coal, the International Gas Union (IGU) said in a new report this week.

Weekend Production Strength Weighs on Natural Gas Futures Early (LOGIN CREDENTIALS REQUIRED)

Natural gas futures struggled for bullish momentum in early trading Monday as strong production readings overshadowed an upcoming cold shot forecast for the northern Lower 48.

Geologic Hydrogen Attracts Interest as a Clean Energy Source

Geologic hydrogen's potential as a decarbonization fuel has spurred millions in investment and no fewer than 10 exploration companies looking to monetize its tantalizing prospects, but significant challenges remain before the prospective low carbon fuel can achieve widespread use.

More Consolidation Could Increase Focus on Emissions Reduction

'Consolidation is going to translate to probably more intensive efforts around low carbon,' Pickering Energy Partners founder says in the wake of Exxon Mobil's massive acquisition of Pioneer Natural Resources.

SPE Joins Aiming for Zero Methane Emissions Initiative To Magnify Access to Knowledge and Best Practices Across the Globe

SPE recently became a supporting organization of the Aiming for Zero Methane Emissions Initiative, which aims to reduce methane emissions from oil and gas operations to near zero by 2030.



SELECTED RECENT TRANSACTIONS

Ellipsis U.S. Onshore Holdings Acquires Additional Assets Located in The Delaware Basin

Ellipsis U.S. Onshore Holdings LLC ("Ellipsis"), a portfolio company of Westlawn Group LLC ("Westlawn"), recently announced the acquisition of additional assets located in the Delaware Basin of Texas and New Mexico

Exxon Mobil Agrees to Buy Pioneer Natural Resources for Nearly \$60 Billion in All-Stock Merger

Exxon Mobil said recently that it agreed to buy shale rival Pioneer Natural Resources for \$59.5 billion in an all-stock deal, or \$253 per share.

Kimmeridge Signs Deals for Eagle Ford Assets, Gas Transport

Kimmeridge Texas Gas (KTG), an affiliate of investment firm Kimmeridge, has signed a definitive agreement to acquire certain upstream assets from an undisclosed private seller in a bid to expand its footprint in the Eagle Ford shale play.

Vitesse Energy Acquires \$50 Million in Oil, Gas Interests in North Dakota's Williston Basin

Vitesse Energy has acquired additional oil and gas interests in the Williston basin of North Dakota that will result in approximately \$50 million of acquisition and related development capital expenditures, primarily in the third and fourth quarters of 2023, the company said recently.

Civitas Resources to Buy Permian Assets For About \$2.1 bln

Civitas Resources will buy acreage in the oil-rich Permian Basin from global energy trader Vitol's U.S. upstream venture for about \$2.1 billion in cash and stock, the U.S. oil and gas producer said recently.

1979 Royalties, LP Announces Northern Midland Basin Minerals & Royalty Acquisition From Peacemaker Royalties

1979 Royalties, LP a subsidiary of Endeavor Energy Resources, announced it has closed the acquisition of oil & gas mineral and royalty interests from Peacemaker Royalties, a portfolio company of EnCap Investments, in the Midland Basin for \$61 million in cash.

W&T Offshore Acquires Eight Oil, Gas Producing Assets in Gulf of Mexico

W&T Offshore, Inc. has completed the acquisition of working interests in eight shallow water oil and gas producing assets in the central and eastern shelf region of the Gulf of Mexico from an undisclosed private seller.

Santos to Divest Half of Working Interest in 148 Leases at Alaska North Slope

Australian oil and gas major Santos said recently it would divest half of its working interest in 148 exploration leases in the Langiappe area on the Alaska North Slope in a farm-down agreement with two U.S.-based companies.

Momentum Minerals Operating II, LP Closes Permian Basin Mineral and Royalty Acquisition

Momentum Minerals has closed the acquisition of a Permian Basin mineral and royalty package from Post Oak Crown Minerals, LLC and Post Oak Legacy Assets I, LLC, both of which are affiliates of Post Oak Energy Capital, LP

Vital Energy acquires Permian Basin Assets from Henry, Maple and Tall City

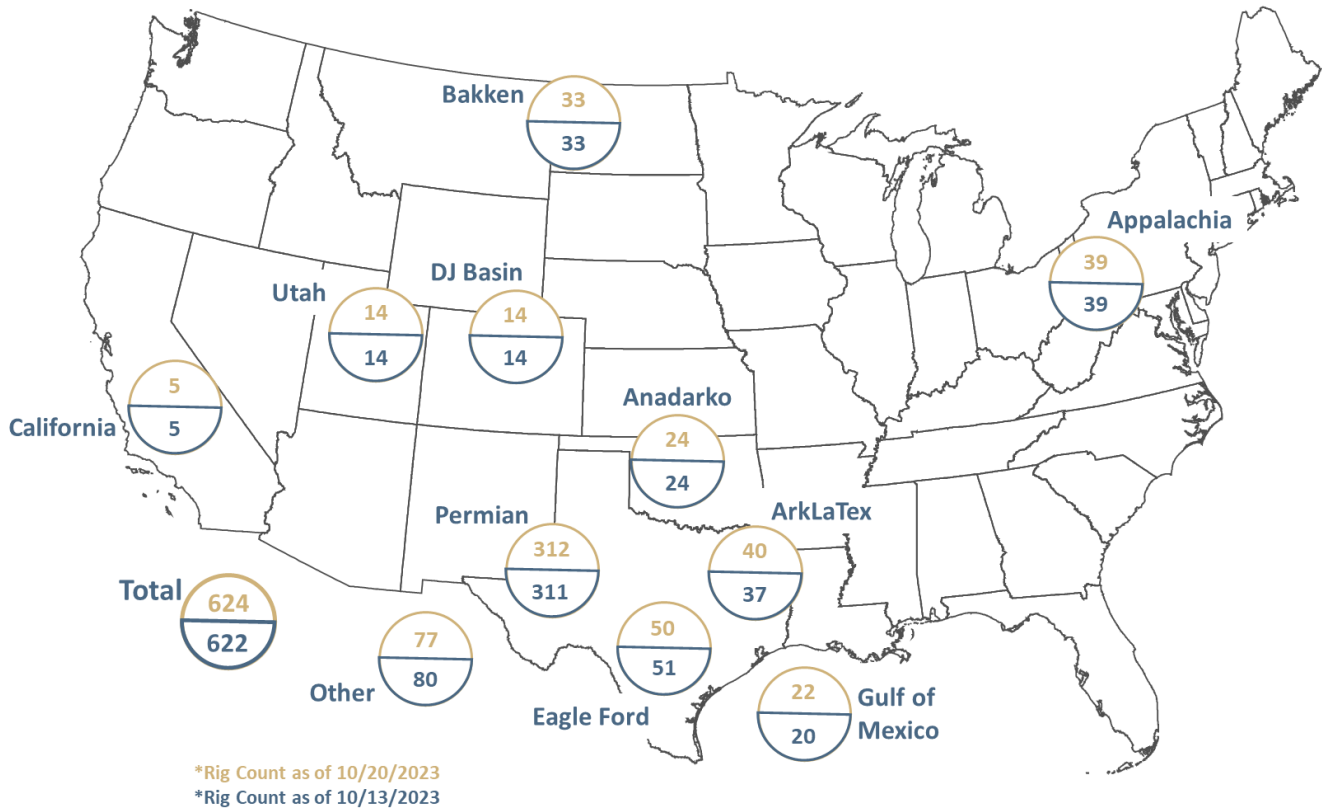
Vital Energy has signed agreements valued at about \$1.17 billion to expand its acreage in the Permian Basin, where dealmaking is gathering pace as drillers tap the largest U.S. oil patch to quickly replenish their depleting reserves.

Magnolia Oil & Gas Announces Bolt-On Asset Acquisition in Giddings

Magnolia Oil & Gas Corporation announced recently that the Company has entered into a definitive purchase agreement to acquire certain oil and gas producing properties including leasehold and mineral interests in Giddings for \$300 million, subject to customary purchase price adjustments.



RIG ACTIVITY BY US REGION

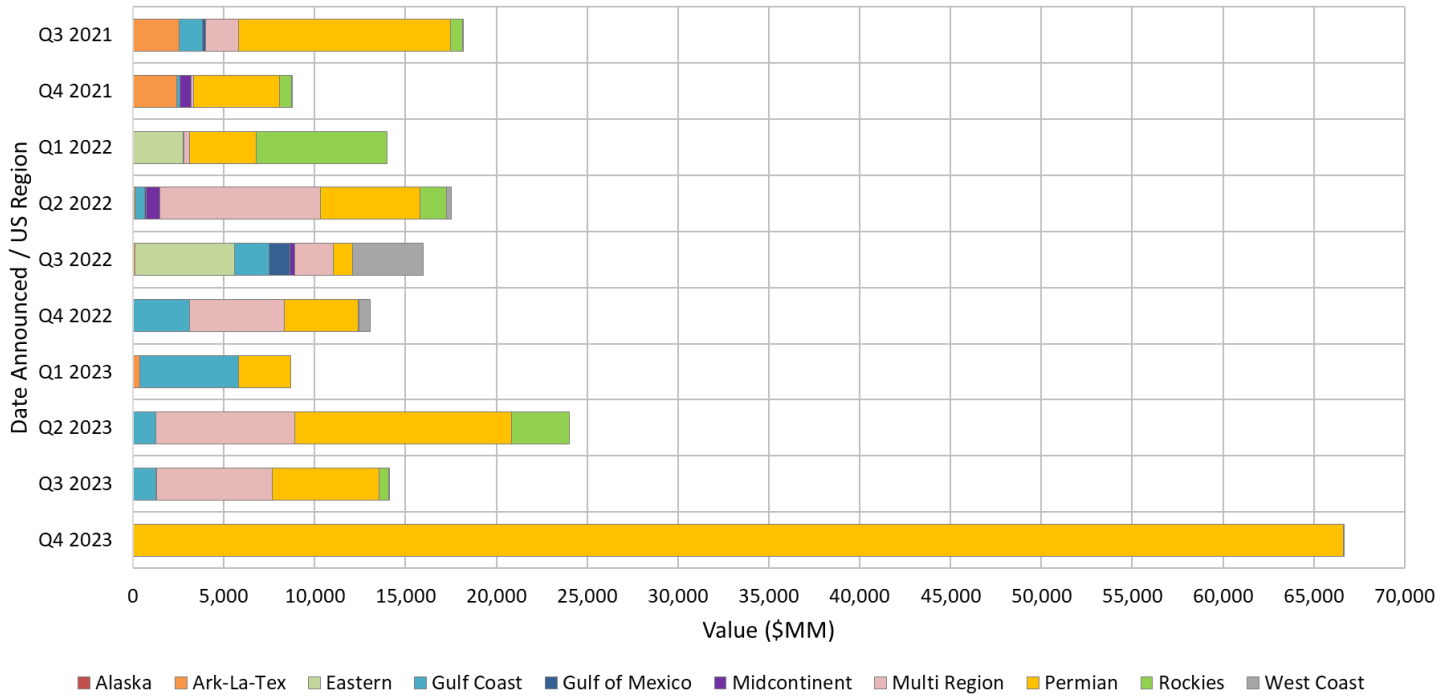


	Week Ending 10/20/2023			Week Ending 10/13/2023		Week Ending 10/21/2022
U.S. Rig Breakouts	Count	+/-	Count	+/-	Count	
Oil	501	4	497	(109)	610	
Gas	117	(1)	118	(40)	157	
Not Specified	4	0	4	2	2	
Directional	51	(2)	53	10	41	
Horizontal	554	1	553	(151)	705	
Vertical	17	4	13	(6)	23	
Land (Inc Others)	598	2	596	(154)	752	
Inland Waters	2	(1)	3	(1)	3	
Offshore	22	2	20	8	14	
US Total	622	3	619	(147)	769	

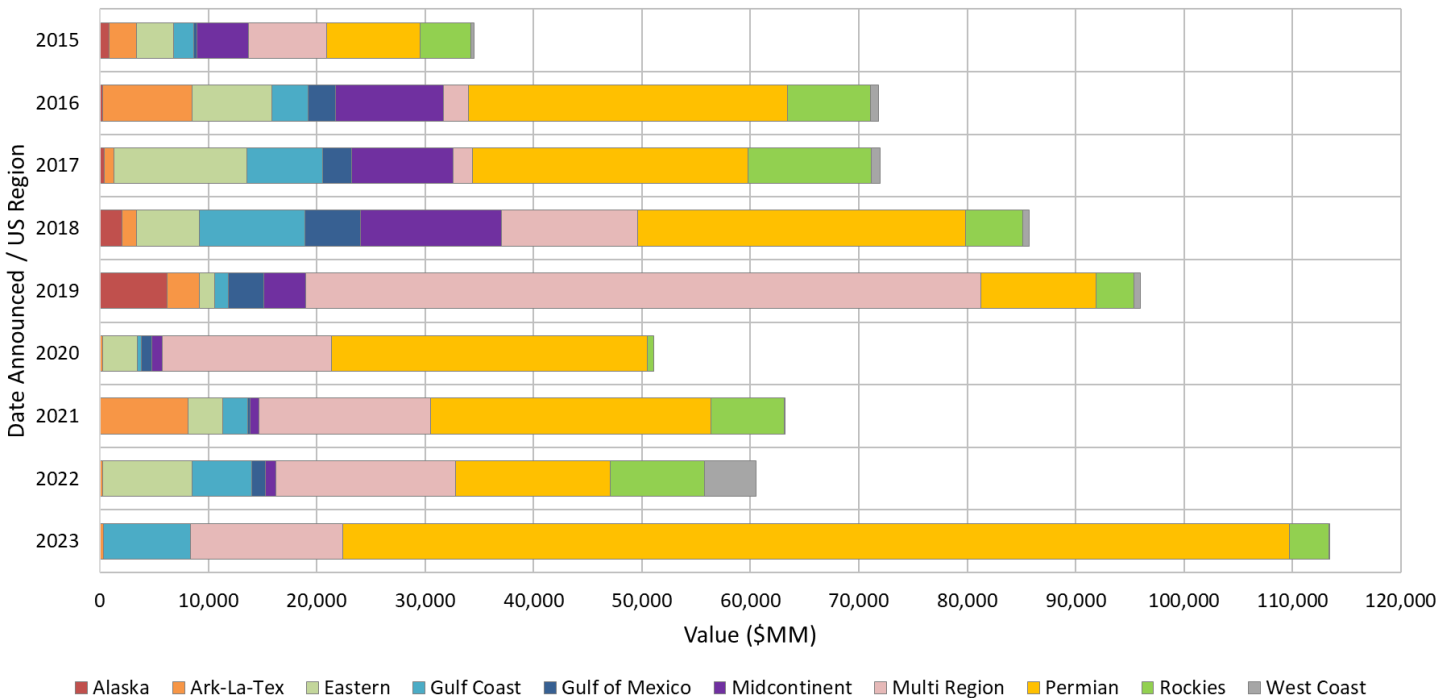
*Source—Baker Hughes Weekly Rig Counts



DEAL VALUE BY US REGION (BY QUARTER)



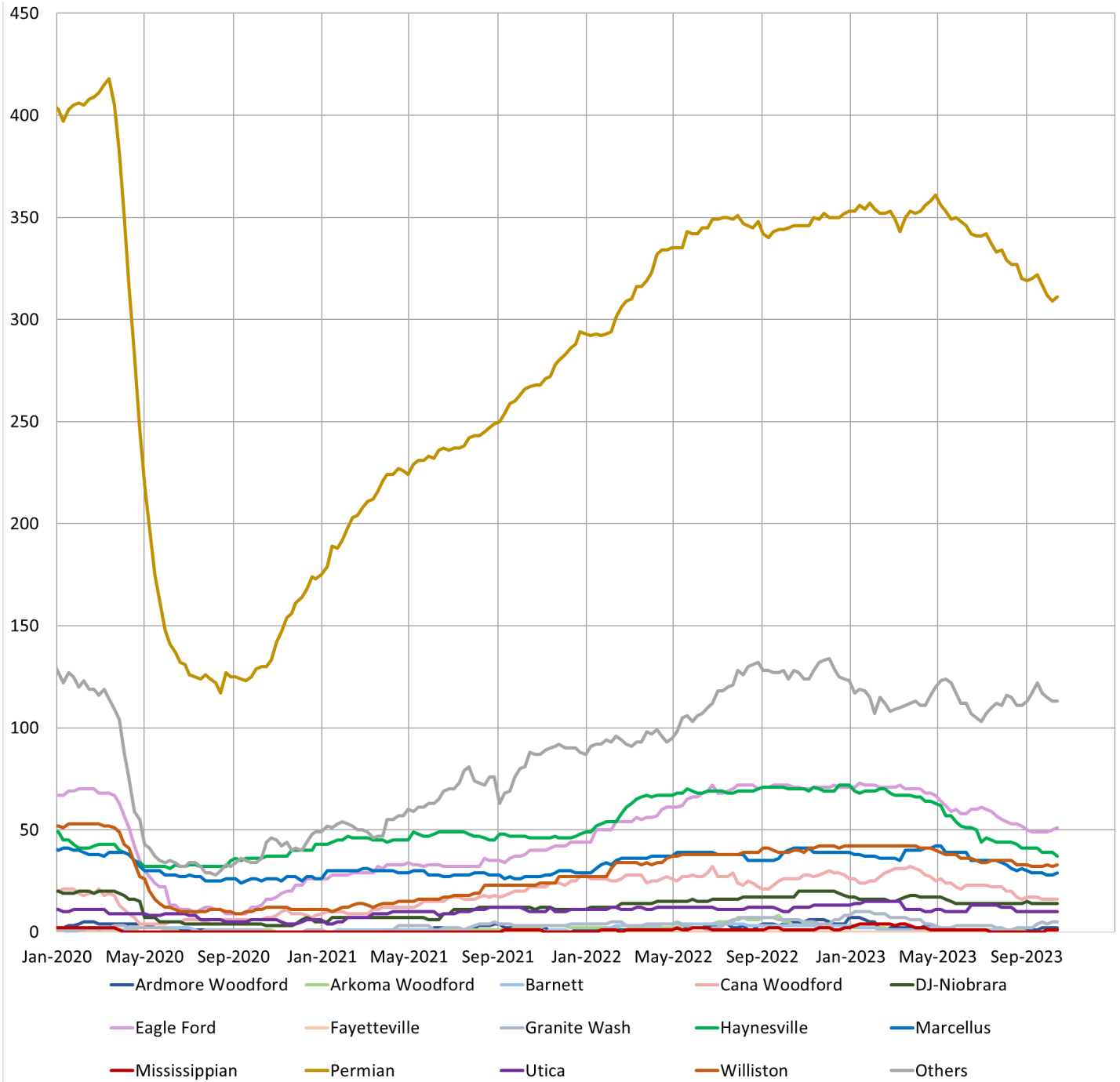
DEAL VALUE BY US REGION (BY YEAR)



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



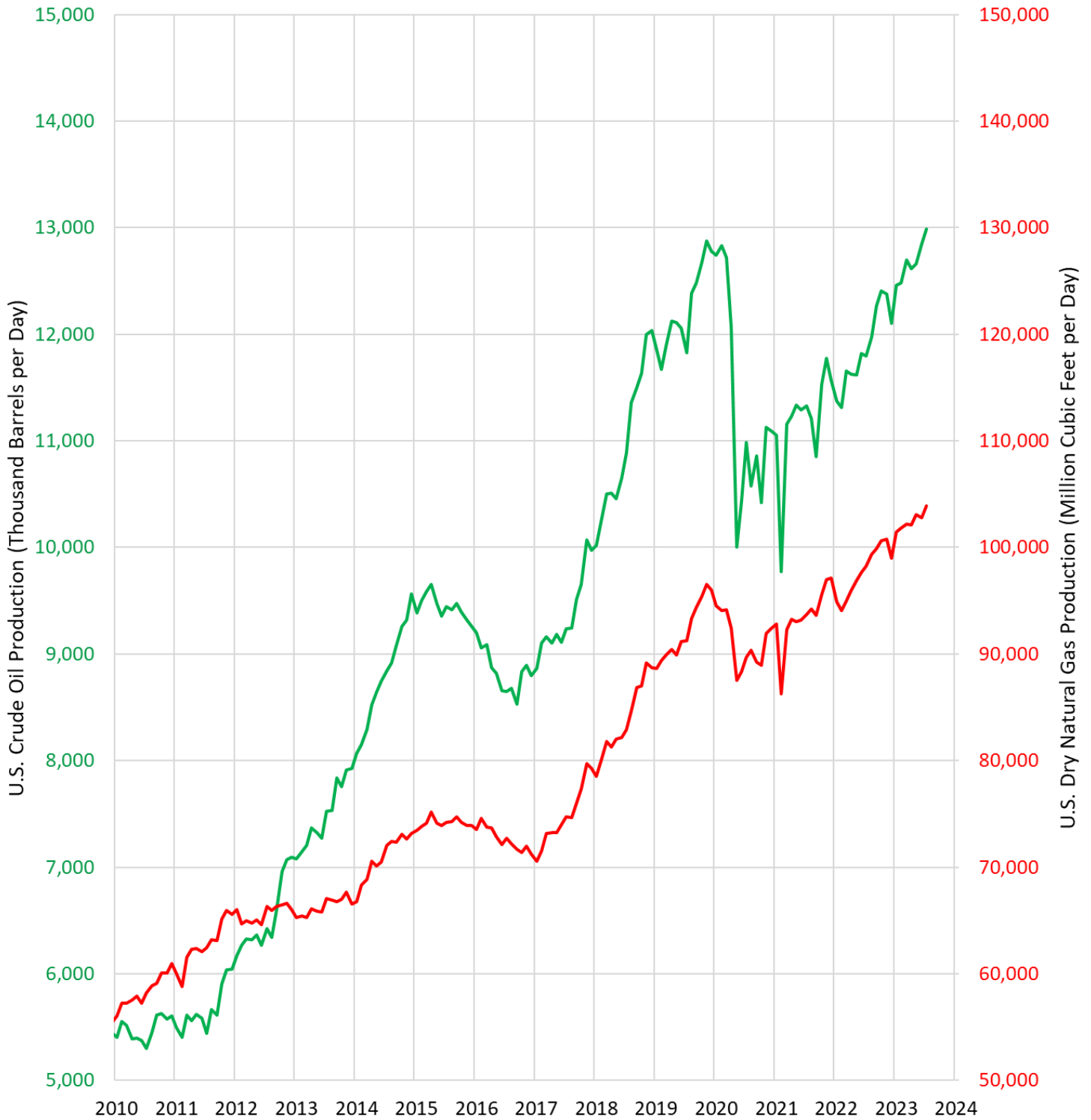
RIG ACTIVITY BY US REGION



*Source—Baker Hughes Weekly Rig Counts



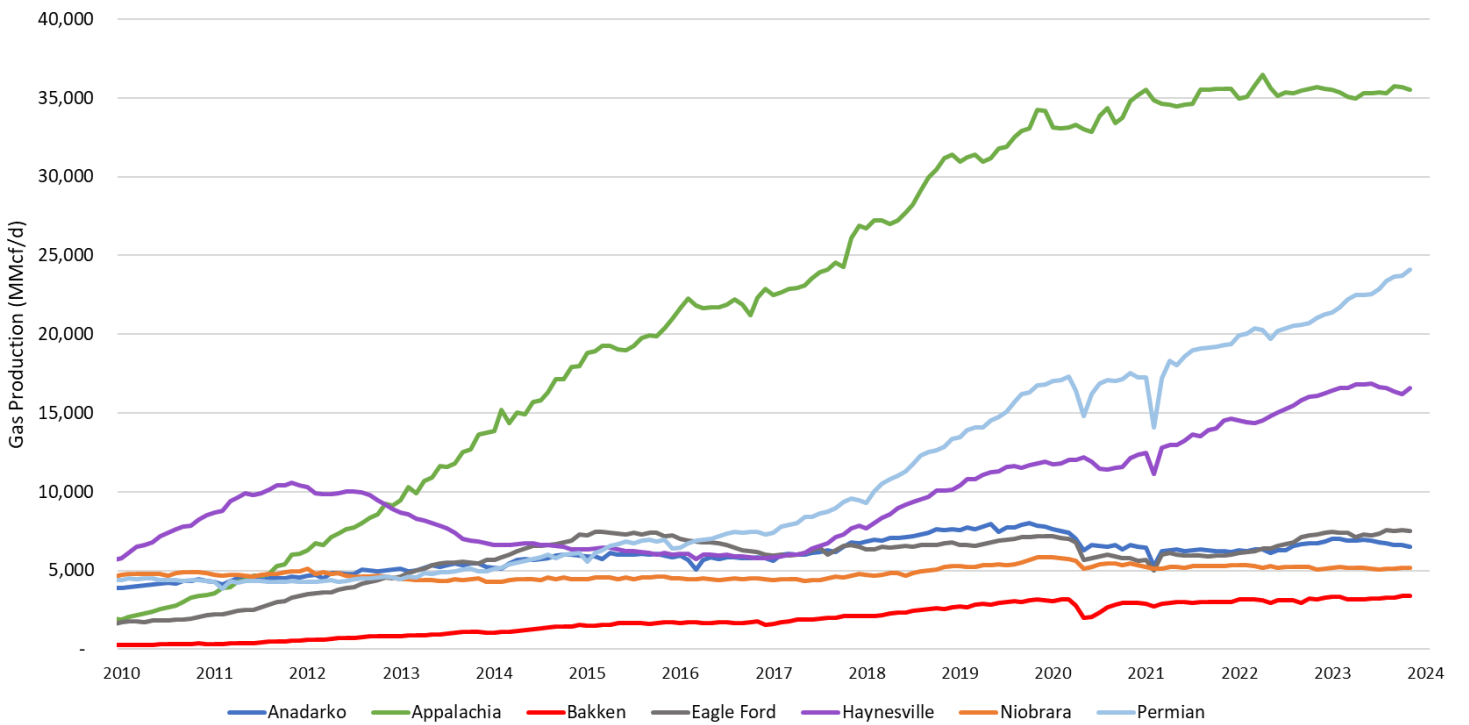
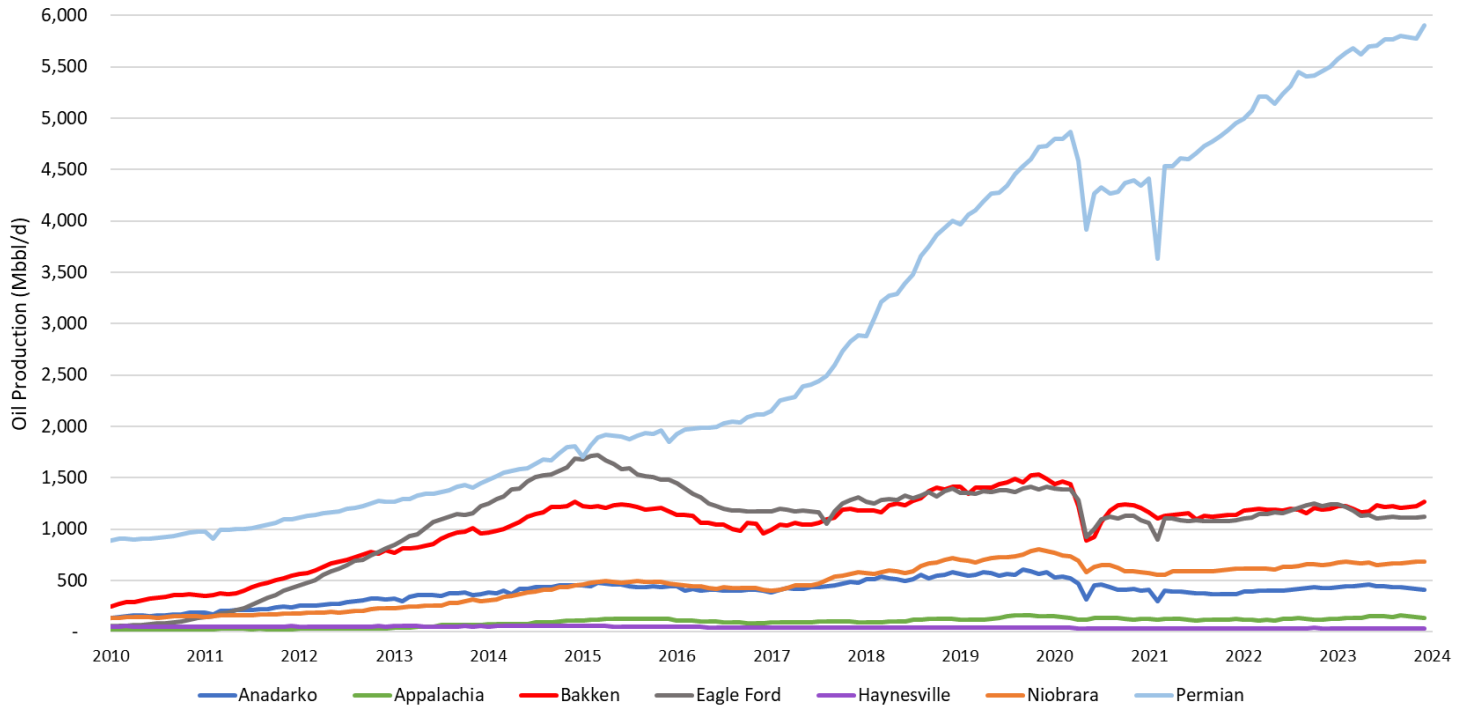
US DAILY CRUDE (MMbbl) & DRY NATURAL GAS PRODUCTION (MMcf)



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



HISTORICAL PRODUCTION OF SELECTED US SHALE REGIONS



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



UPCOMING EVENTS

October 2023

[Small Steps Golf Classic](#)

October 30

Houston, TX

[Digital Wildcatters—FUZE](#)

October 30-31

Houston, TX

November 2023

[IPAA Annual Meeting](#)

November 6-8

San Antonio, TX

[AICPA Oil & Gas Conference](#)

November 8-10

Las Vegas, NV

[OSU Accounting and Financial Reporting Conference](#)

November 16

Tulsa, OK

[OSU Oil and Gas Accounting Conference](#)

November 17

Tulsa, OK

[Boys & Girls Club 8th Annual Sporting Clays Tournament](#)

November 17

Houston, TX

[IPAA Texas Hold'Em Tournament](#)

November 30

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.

