



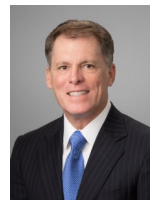
Weekly E&P Update

March 19, 2024

Vol. 12

Jafurah's Proven Reserves Expand

By Steve Hendrickson
President of Ralph E. Davis Associates



I've recently read several articles about the increases in proved reserves at Saudi Aramco's Jafurah Basin project. The Jafurah Basin is one of three unconventional gas plays that the company targeted in its Accelerated Transformation Program in 2010. What caught my eye about the increases in reserves was what [was described by the company](#) as a "novel approach to shale reserves booking, which was applied to unconventional resources for the first time in the industry and has the potential to be deployed at scale." The company added, "reserve booking practices were assessed through establishing continuity of resources and consistency of performance."



Fig. 1 – Location map of the Jafurah Basin east of the great Ghawar field. The dashed line defines the approximate boundary of the primary area of interest within the basin.

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(Source: WPC, "Saudi Arabia's Unconventional Program in the Jafurah Basin")

Proved unconventional reserves at Jafurah are immense. The reserves added due to the novel approach were significant (15 TCF of gas and 2 billion barrels of condensate). Still, these volumes represent only a marginal increase in the play's proved reserves, which now stand at 229 TCF and 45 billion barrels of condensate. The play is comparable in size to the Eagle Ford shale in south Texas and has similar rock and reservoir properties. In the same way that the Eagle Ford is the source rock for the overlying Austin Chalk play, the primary unconventional formation at Jafurah, the Tuwaiq Mountain ("TQMN"), is the source rock for the [Ghawar oil field](#), the world's largest. An important distinction, however, is that the Eagle Ford has a reservoir in maturity windows ranging from black oil to dry gas; the TQMN is entirely in the gas condensate window.

A paper presented at the 2017 World Petroleum Congress ([WPC 22-1223](#)) described the challenges faced in developing the field. At that time, the field was in the pilot phase before entering full development. Although the unique land situation (Saudi Aramco owns all the acreage in the play) allowed for a measured and holistic approach to drilling appraisal wells, understanding the geology and reservoir characteristics (which vary significantly over the play), and testing different completion strategies, the lack of infrastructure initially created material delays in drilling and completing wells. The lack of infrastructure also prevented the company from producing wells for extended periods, necessary to determine actual production performance and estimate the ultimate recovery.

Parameter	Eagle Ford	Jafurah
Basin Area (km ²)	~36,000	N/A
Estimated GIP/Section (BCF/section)	~150	N/A
Target Thickness (ft.)	100 - 475	110 - 150
Average TOC (%)	2 - 12%	2-10%
Vitrinite Reflectance (%Ro)	1.0 - 1.27	1.0-1.3
Porosity (%)	9-12	5-12
Permeability	Nano Darcy Range	Nano Darcy Range
Cond Ratio (bbbl/MMCF)	~ 0 - 1000+	~ 20 - 400+
Lateral lengths (ft.)	3,500 - 7,000	~5,000 - 7,000

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(Source: WPC, "Saudi Arabia's Unconventional Program in the Jafurah Basin")

The [company has drilled 150 wells](#) in the play, and production is expected to begin this year. Production is expected to peak in 2036 with daily rates of 2.2 BCF and 550,000 barrels of liquids. Unfortunately, I've not found any information on the "novel approach" to booking proved reserves they mentioned in their press release. It sounds intriguing, so hopefully, more will be written about it; if so, we'll share that in a future newsletter.

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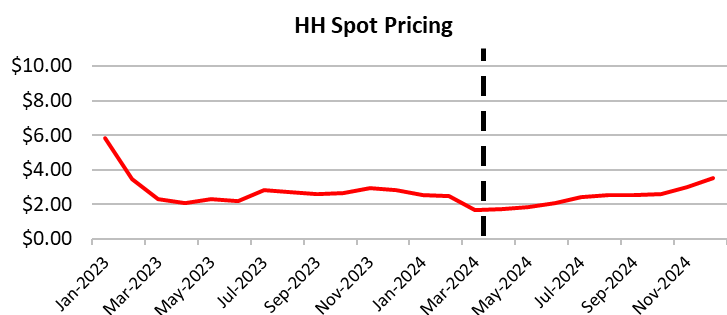
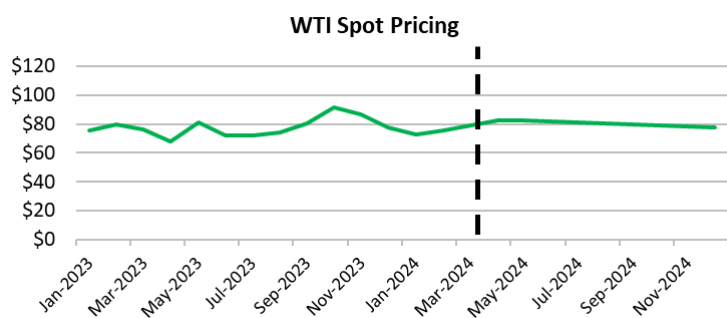
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NYMEX FUTURE PRICING



MONDAY'S MARKET CLOSE

NYMEX WTI CRUDE OIL FUTURES as of March 18, 2024 Close (\$/bbl)

Period	Current	WoW Change	Last Week	1 Yr Ago
2024	\$80.12	\$4.10	\$76.02	\$65.22
2025	\$73.97	\$2.71	\$71.26	\$63.57
2026	\$69.70	\$1.85	\$67.85	\$62.08
2027	\$67.00	\$1.28	\$65.72	\$60.65
2028	\$65.37	\$0.81	\$64.56	\$59.21

NYMEX HH NATURAL GAS FUTURES as of March 18, 2024 Close (\$/MMBtu)

Period	Current	WoW Change	Last Week	1 Yr Ago
2024	\$2.47	\$0.01	\$2.46	\$3.59
2025	\$3.48	\$0.04	\$3.44	\$4.20
2026	\$3.80	\$0.02	\$3.78	\$4.38
2027	\$3.81	\$0.02	\$3.79	\$4.36
2028	\$3.76	(\$0.01)	\$3.77	\$4.35

INDUSTRY METRICS—QUICK SNAPSHOT

	Current	Last Week	WoW Change	%Change
Crude Oil Near-Month Price (\$/bbl)	\$81.03	\$77.80	\$3.23	4%
Natural Gas Near-Month Price (\$/MMBtu)	\$1.69	\$1.81	(\$0.12)	(6%)
Weekly Upstream-Deal Transaction Value (\$MM)	\$0.17	\$0.00	\$0.17	-
Weekly Number of Upstream-Deal Transactions	1	3	(2)	(67%)
Current Total US Rig Count	629	622	7	1%
US Field Crude Oil Production (MMbbl/day)	13.1	13.2	(0.1)	(0.8%)
US Field Dry Natural Gas Production (Bcf/day)	105.7	105.8	(0.1)	(0.1%)
Commercial Crude Oil Stocks-Excluding SPR (MMbbl)	447	449	(2)	(0.3%)
Natural Gas Stocks-Working Gas Underground Storage (Bcf)	2,325	2,334	(9)	(0.4%)
Total Drilled But Uncompleted Wells (DUC-Last Month)	4,483	4,386	97	2%

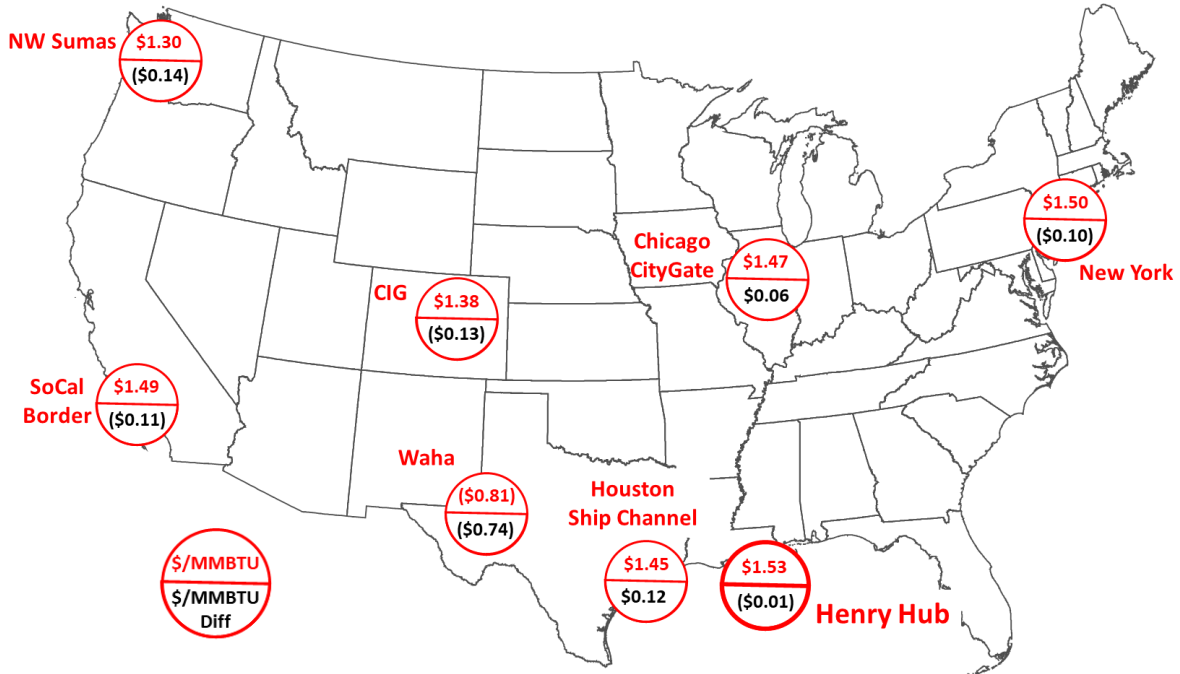
*Source—Energy Information Administration, United States (EIA)

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

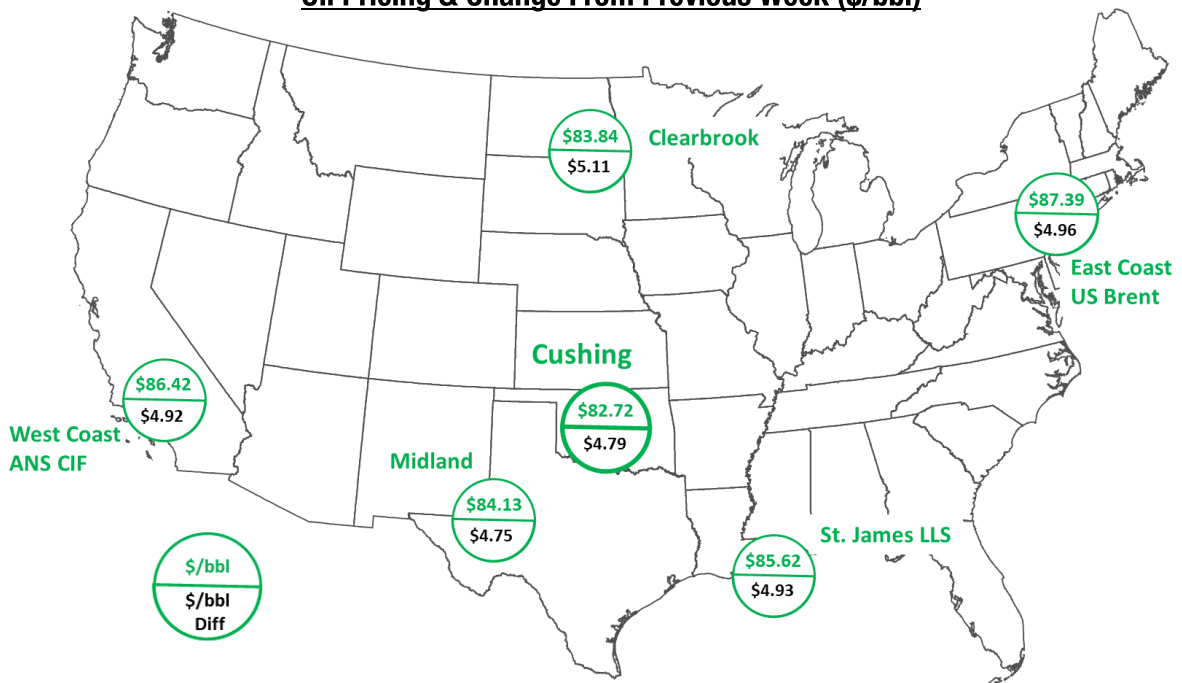


US COMMODITY PRICES CONTINUED

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



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



*Source—Bloomberg LP



SELECTED INDUSTRY HEADLINES

Biden's SPR Gamble Sparks Debate Over U.S. Energy Security

The SPR was aggressively depleted by 291 million barrels during Biden's first two and a half years, primarily in response to rising gasoline prices and the Ukraine crisis.

New Technology Is Fueling America's Oil Boom

The EIA analysis notes that not only did the U.S. break the previous record in 2023, but speculated that no other nation is likely to break it any time soon.

EIA Boosts USA Crude Oil Production Forecasts

The U.S. Energy Information Administration (EIA) increased its forecasts for U.S. crude oil production for both 2024 and 2025 in its latest short term energy outlook (STEO), which was released last week.

Oil at Highest Since Early November on Brighter Demand Signals

Oil prices hit four-month highs on Tuesday after breaking above range-bound trading last week, but gains were capped by the prospect of rising exports from Russia as Ukrainian attacks on oil infrastructure curb domestic refining activity.

Oil Posts Weekly Gain as Crude Market Expected to Tighten

Crude oil futures fell slightly Friday but gained for the week after rising in the two previous sessions.

TPH: Lower 48 to Shed Rigs Through 3Q Before Gas Plays Rebound (LOGIN CREDENTIALS REQUIRED)

TPH&Co. analysis shows the Permian Basin will lose rigs near term, but as activity in gassy plays ticks up later this year, the Permian may be headed towards muted activity into 2025.

Biden's Gas Export Pause Faces Second Probe by House Republicans

House Republicans have launched a second probe of the Biden administration's move to pause liquefied natural gas export approvals, questioning if election-year politics played a role in the decision.

EIA: Blame Associated Gas Volumes for Sticky Low NatGas Prices (LOGIN CREDENTIALS REQUIRED)

Low natural gas prices are forcing U.S. producers to finally pump the brakes on what has been record production. But the pullback in drilling will have muted effects on a market already glutted with too much gas, federal experts say.

Natural Gas Futures Advance Amid Late Season Cooling, Production Weakness (LOGIN CREDENTIALS REQUIRED)

A cooler weather outlook and continued evidence of receding production volumes helped lift natural gas futures in early trading Tuesday.

Protracted Weakness in Spot LNG Market Will Test Buyer-Seller Relationships in 2024

A prolonged period of low spot LNG prices is expected to see the market shift in favor of buyers and seep into broader aspects of the LNG business such as price reviews, contractual terms and long-term deal negotiations in 2024, according to industry experts.

Lower LNG Prices Should Boost Gas Demand, Executives Say

Liquefied natural gas (LNG) prices have fallen about a third over the past nine months, propping up demand, which should tighten the LNG market in the near-term, executives said on Monday at the CERAWEEK energy conference.

Energy Industry's Methane Emissions Near Record Despite Pledges

Global methane emissions from fossil fuels held near a record high last year, the International Energy Agency said in its annual Methane Tracker report, renewing concerns that governments and industry aren't doing enough to stem releases of the devastating greenhouse gas.



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

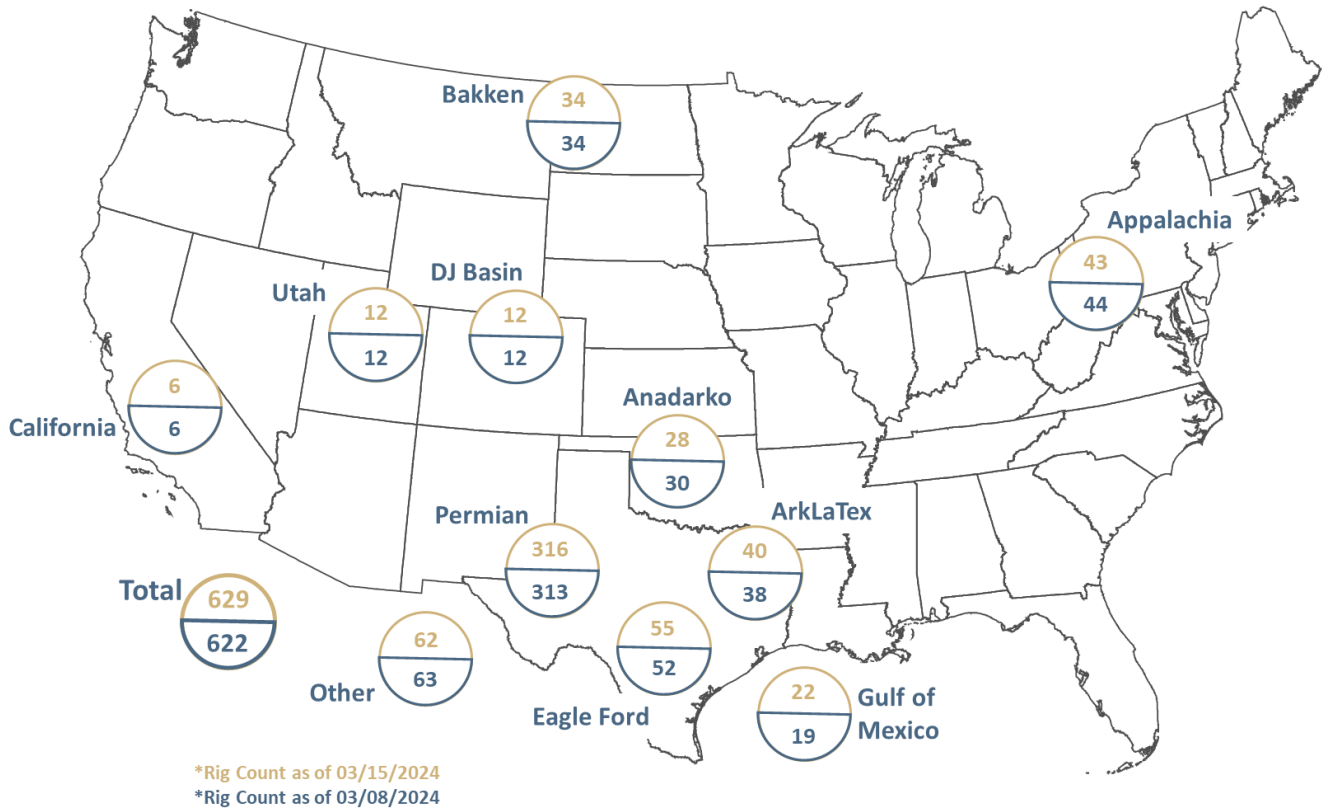
W&T Offshore, Inc. has completed the accretive acquisition of six fields in shallow waters of the U.S. Gulf of Mexico.

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

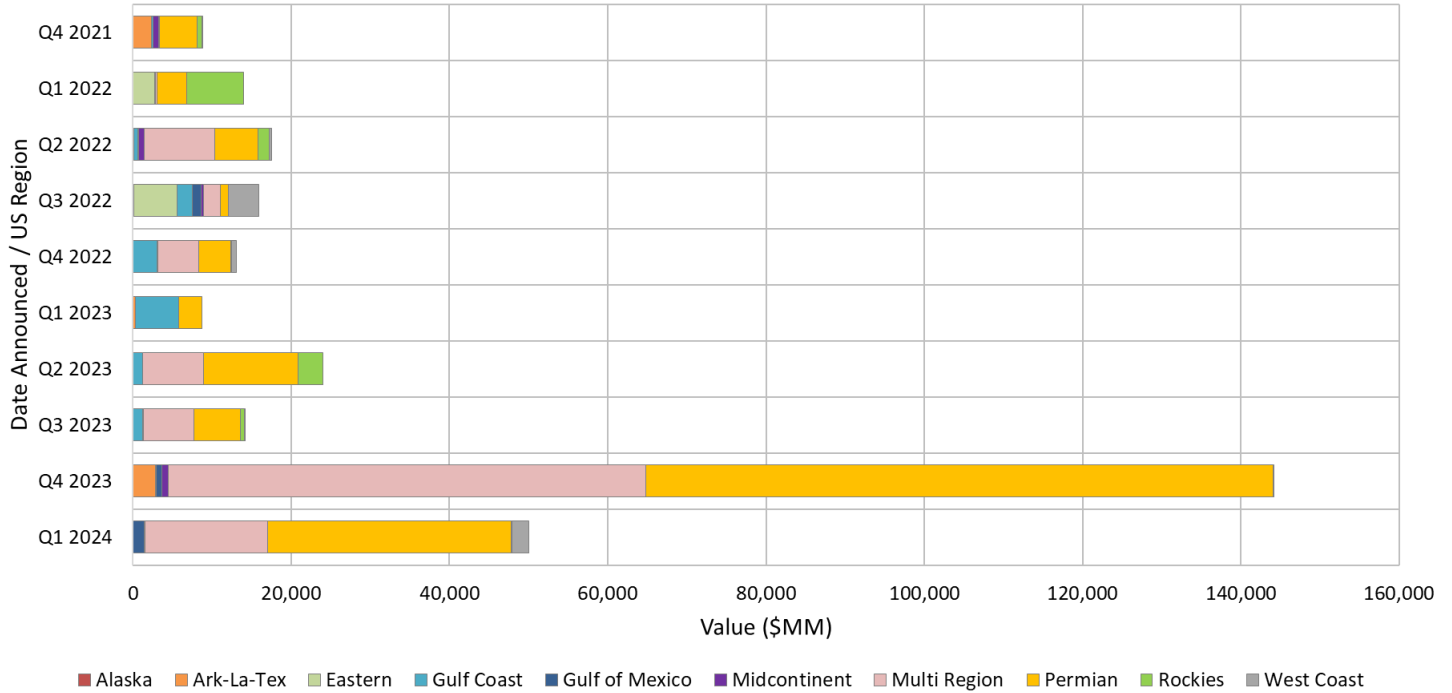


	Week Ending 03/15/2024			Week Ending 03/08/2024		Week Ending 03/17/2023
U.S. Rig Breakouts	Count	+/-	Count	+/-	Count	
Oil	510	6	504	(79)	589	
Gas	116	1	115	(46)	162	
Not Specified	3	0	3	0	3	
Directional	54	2	52	7	47	
Horizontal	562	5	557	(130)	692	
Vertical	13	0	13	(2)	15	
Land (Inc Others)	605	4	601	(131)	736	
Inland Waters	0	0	0	(1)	1	
Offshore	24	3	21	7	17	
US Total	629	7	622	(125)	754	

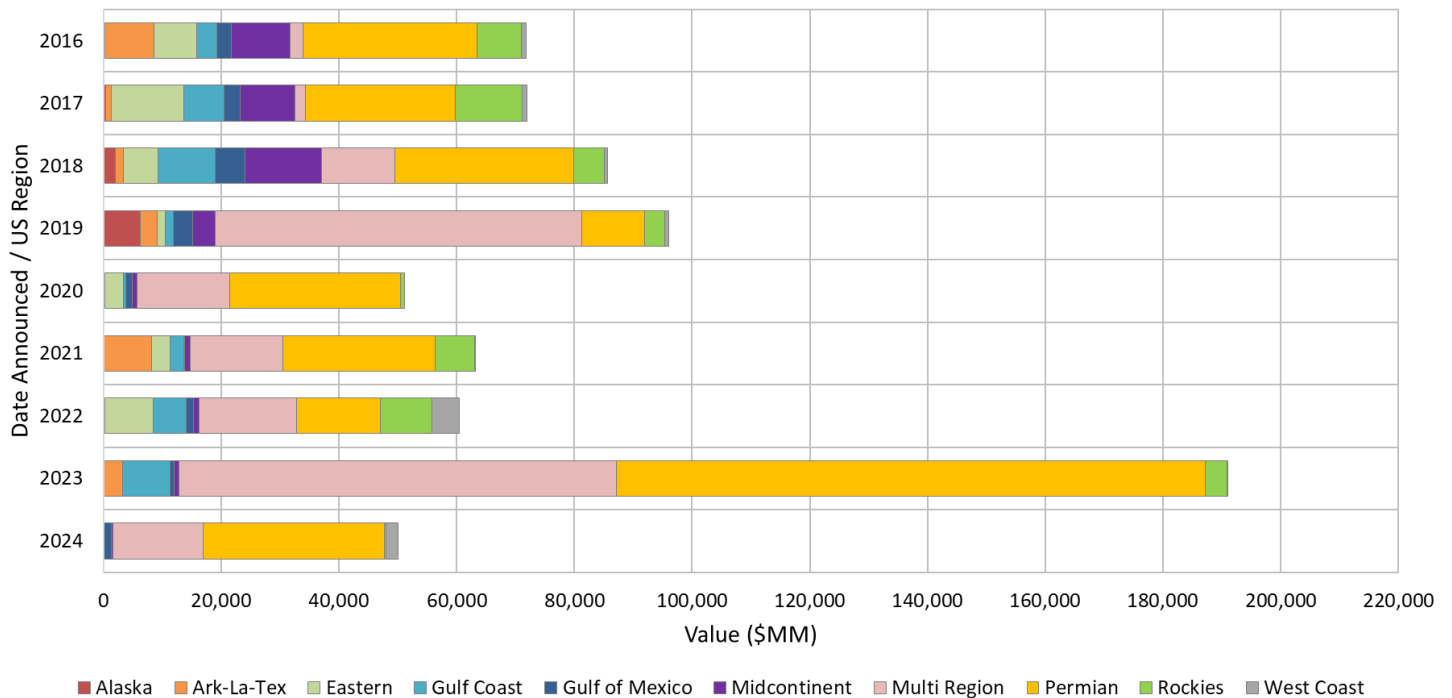
*Source—Baker Hughes Weekly Rig Counts



DEAL VALUE BY US REGION (BY QUARTER)



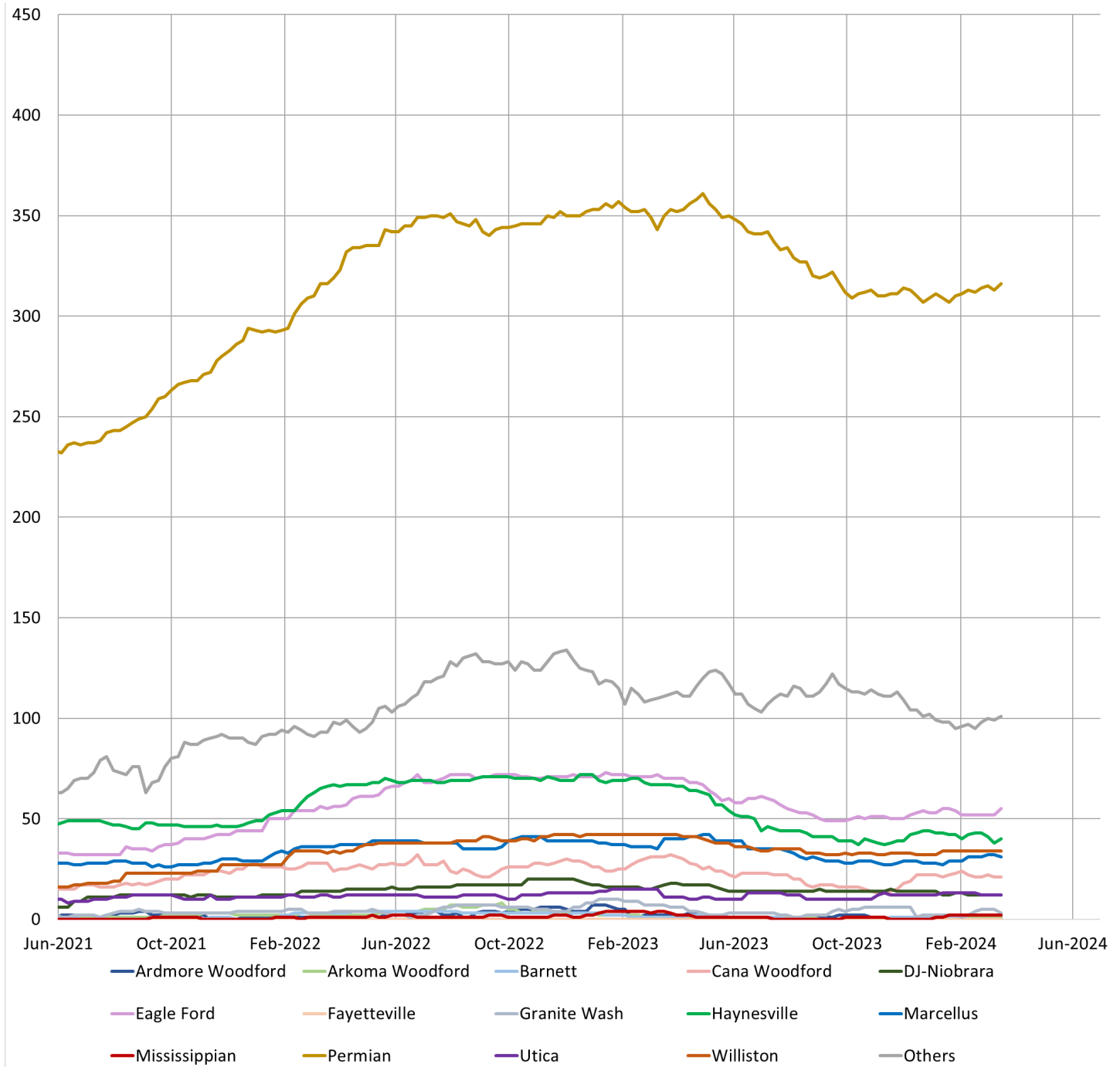
DEAL VALUE BY US REGION (BY YEAR)



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



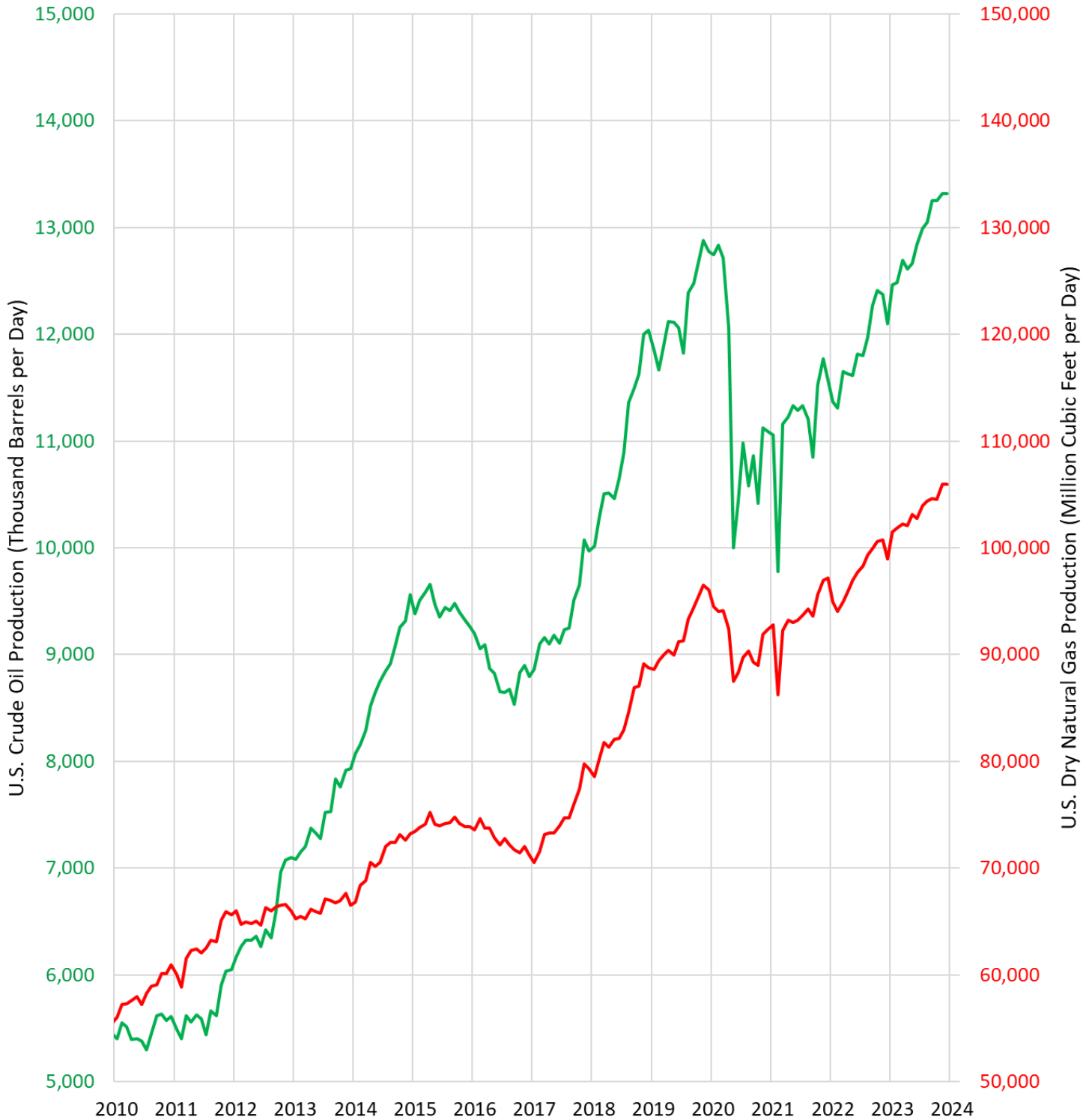
RIG ACTIVITY BY US REGION



*Source—Baker Hughes Weekly Rig Counts



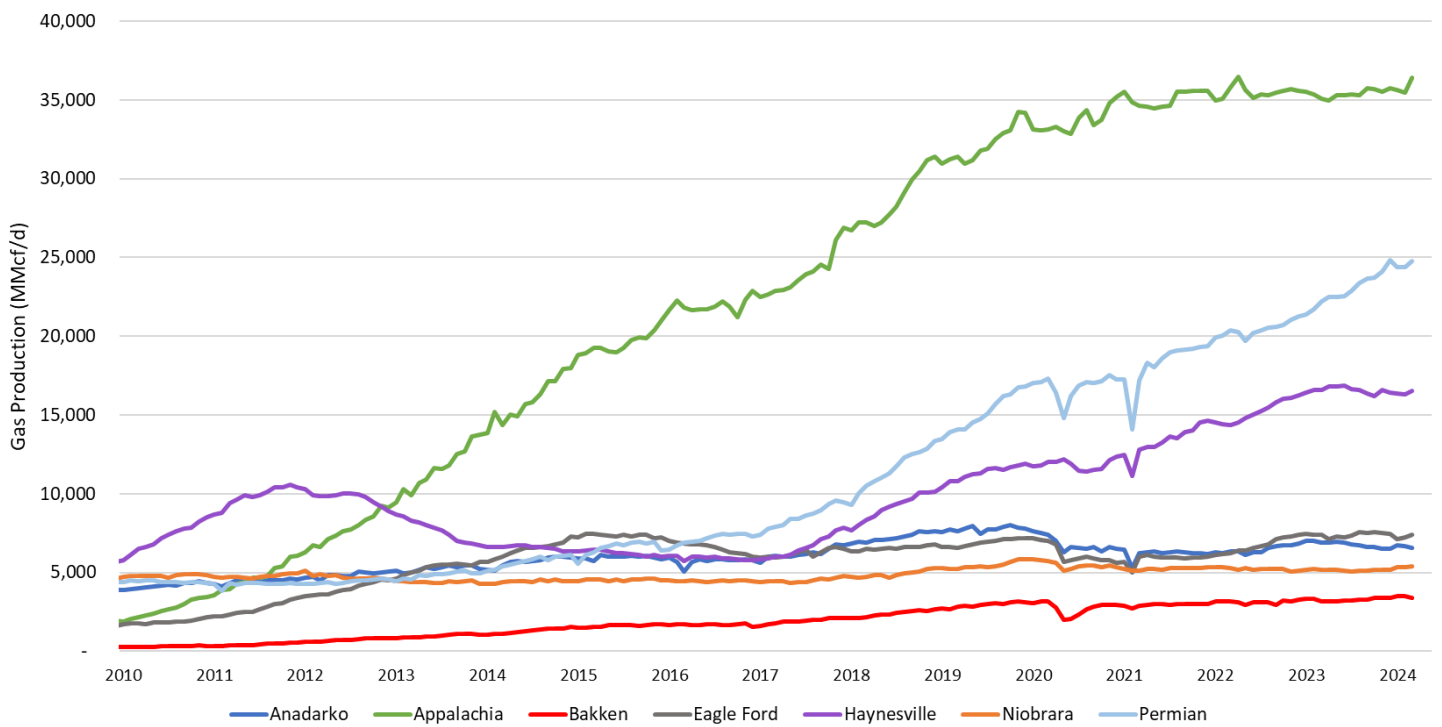
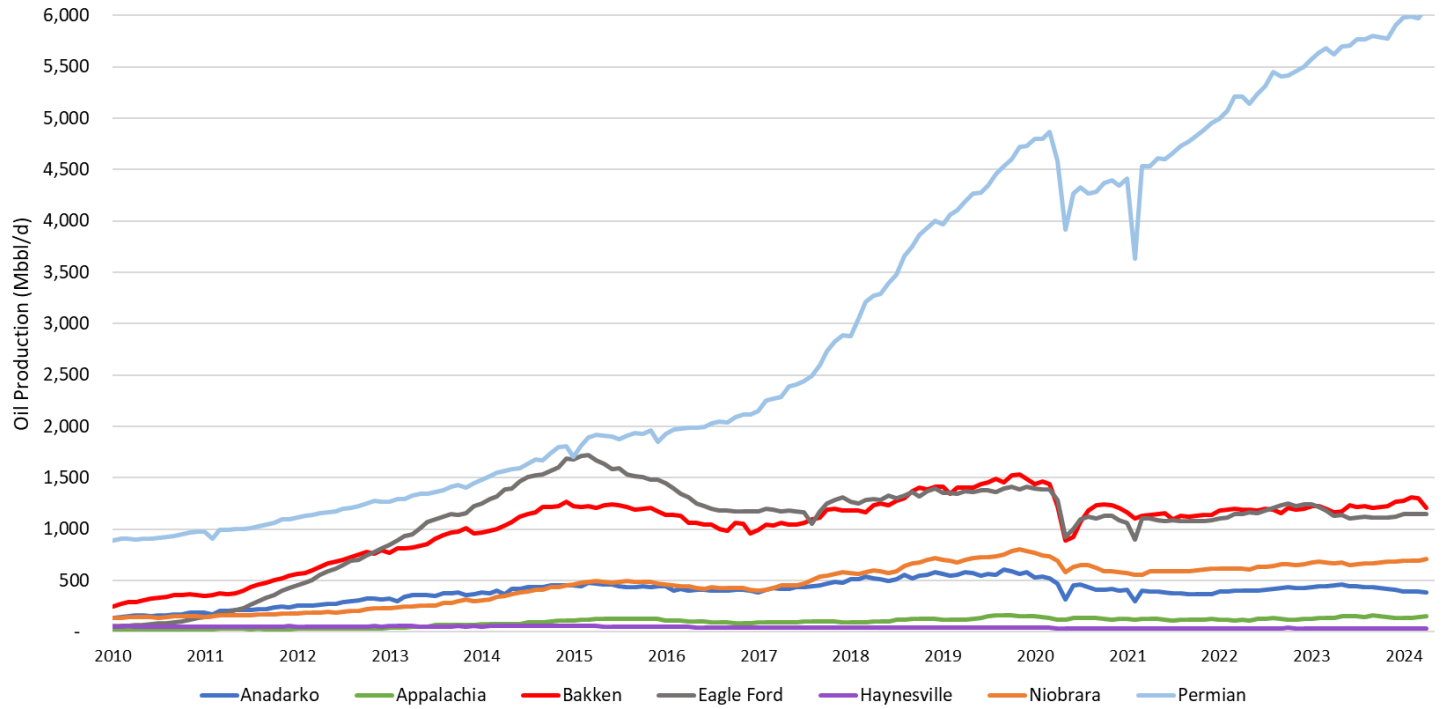
US DAILY CRUDE (MMbbl) & DRY NATURAL GAS PRODUCTION (MMcf)



*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

<u>OneGoal Pathways of Promise Luncheon</u>	March 20	Houston, TX
<u>USA Family Office & High Net Worth Conference</u>	March 21	Houston, TX
<u>ROCC US Men's Clay Court Championship</u>	March 30 - April 7	Houston, TX

April 2024

<u>World Oilman's Poker Tournament (WOPT)</u>	April 3-5	Las Vegas, NV
<u>The Leukemia & Lymphoma Society (LLS) Big Climb</u>	April 6	Houston, TX
<u>HBA & HPF Spring Social</u>	April 11	Houston, TX
<u>World Oilman's Mineral & Royalty Conference (MARC)</u>	April 15-16	Houston, TX
<u>Quorum Qnections Conference</u>	April 23-25	Las Vegas, NV
<u>HPF/SPE Fifth Annual Crawfish Boil</u>	April 24	Houston, TX
<u>World Oilman's Tennis Tournament (WOTT)</u>	April 24-28	Houston, TX
<u>ADAM Energy Golf Tournament</u>	April 29	Frisco, TX

May 2024

<u>Alteryx Inspire 24</u>	May 13-16	Las Vegas, NV
<u>North American Petroleum Accounting Conference</u>	May 16-17	Dallas, TX
<u>ASA Energy Valuation Conference</u>	May 16	Houston, TX
<u>Qnections 24 Barcelona</u>	May 28-30	Barcelona, Spain
<u>Texas Dreamin' 2024</u>	May 30-31	Austin, 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.

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- 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.

